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FILE LAST UPDATED: 4 DEC 2006 <20061204/UP>
MOST RECENT THOMSON SCIENTIFIC UPDATE: 200678 <200678/DW>
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PLEASE SEE

http://www.stn-international.de/stndatabases/details/dwpi_r.html <<<

>>> YOU ARE IN THE NEW AND ENHANCED DERWENT WORLD PATENTS INDEX <<<

=> d 1105 que stat

L24 40640 SEA FILE=HCAPLUS POLYACRYLIC# OR POLYACRYLATE#
 L25 QUE POLYMETHACRYLIC# OR POLYMETHACRYLATE# OR POLY(A) (ACRYLIC# OR ACRYLATE# OR METHACRYLIC# OR METHACRYLATE#) OR (POLY OR POLYM? OR COPOLYM? OR HOMOPOLYM? OR RESIN?) (2A) (ACRYLATE# OR METHACRYLATE# OR ACRYLIC# OR METHACRYLIC#)
 L31 QUE POLY(W) (ETHYLENE# OR ETHENE# OR PROPYLENE# OR PROPENE# OR BUTYLENE# OR ISOBUTYLENE# OR BUTENE#)
 L32 QUE (ETHYLEN## OR PROPYLEN## OR BUTYLEN## OR BUTEN## OR OLEFIN##) (A) (POLYMER? OR POLYM# OR HOMOPOLYMER? OR HOMOPOLYM# OR RESIN?)
 L34 QUE POLYAMIDE?
 L36 QUE POLYCARBONATE?
 L37 QUE SUBSTRAT?
 L69 221363 SEA FILE=WPIX BATTERY OR BATTERIES
 L70 17287 SEA FILE=WPIX LITHIUM? (2A) L69
 L71 132772 SEA FILE=WPIX (NEGATIVE? OR NEG#) (A) ELECTROD## OR ANOD##

 L72 97316 SEA FILE=WPIX ROUGH?
 L73 39148 SEA FILE=WPIX ?ANGSTROM?
 L74 46700 SEA FILE=WPIX ?SMOOTH? (2A) SURFACE?
 L75 165888 SEA FILE=WPIX L24 OR L25
 L76 231364 SEA FILE=WPIX POLYESTER?
 L77 87022 SEA FILE=WPIX POLYOLEFIN?
 L78 338216 SEA FILE=WPIX POLYETHYLENE# OR POLYETHENE# OR PE OR POLYPROPYLENE# OR POLYPROPENE# OR PP OR POLYBUTYLENE# OR POLYISOBUTYLENE# OR POLYBUTENE# OR POLYISOBUTENE#
 L79 205772 SEA FILE=WPIX L31 OR L32 OR L34 OR L36
 L80 26436 SEA FILE=WPIX CONDUCT? (2A) (POLYM? OR COPOLYM? OR HOMOPOLYM? OR RESIN?)
 L81 28948 SEA FILE=WPIX L69 AND L71
 L82 495 SEA FILE=WPIX L81 AND (L72 OR L73 OR L74)
 L83 55 SEA FILE=WPIX L82 AND L37
 L84 16 SEA FILE=WPIX L83 AND (L75 OR L76 OR L77 OR L78 OR L79 OR L80)
 L85 15 SEA FILE=WPIX L84 AND (L72 OR L73)
 L86 7 SEA FILE=WPIX L85 AND L70
 L87 15 SEA FILE=WPIX L85 OR L86
 L102 37 SEA FILE=WPIX L83 AND METAL#
 L103 33 SEA FILE=WPIX L102 AND (L72 OR L73)
 L104 11 SEA FILE=WPIX L103 AND L70
 L105 19 SEA FILE=WPIX L87 OR L104

=> d 1105 ifull 1-19

L105 ANSWER 1 OF 19 WPIX COPYRIGHT 2006 THE THOMSON CORP on STN
 ACCESSION NUMBER: 2006-527564 [54] WPIX
 DOC. NO. CPI: C2006-165135 [54]
 DOC. NO. NON-CPI: N2006-422523 [54]
 TITLE: Preparation of **anode** film for thin film
battery involves sputtering **lithium**
metal oxide layer on **substrate** in
 vacuum chamber at specified temperature to provide
battery with very long life time, high
 safety, high versatility in shape
 DERWENT CLASS: L02; L03; V05; X16
 INVENTOR: HSU F; LIAO Y; TAI N; WANG C; WU M
 PATENT ASSIGNEE: (SINI-N) ACAD SINICA

COUNTRY COUNT: 1

PATENT INFORMATION:

| PATENT NO | KIND | DATE | WEEK | LA | PG | MAIN IPC |
|----------------|------|----------|-----------|----|----|----------|
| US 20060151313 | A1 | 20060713 | (200654)* | EN | 14 | [6] |

APPLICATION DETAILS:

| PATENT NO | KIND | APPLICATION | DATE |
|----------------|------|---------------|----------|
| US 20060151313 | A1 | US 2005-35855 | 20050113 |

PRIORITY APPLN. INFO: US 2005-35855 20050113

INT. PATENT CLASSIF.:

IPC ORIGINAL: C23C0014-00 [I,A]

BASIC ABSTRACT:

US 20060151313 A1 UPAB: 20060822

NOVELTY - An **anode** film is prepared by sputtering a lithium **metal** oxide layer on a **substrate** in a vacuum chamber at above 300degreesC.

DETAILED DESCRIPTION - Preparation of **anode** film involves: preparing a target material to supply lithium and **metal** ions; preparing a **substrate** comprising a base layer, a buffer layer and a noble **metal** current collector layer; sputtering a LiMO (M = **metal** material) layer on the **substrate** in vacuum chamber at above 300degreesC; and reducing the temperature to obtain the **anode** film.

An INDEPENDENT CLAIM is also included for a method for preparing a thin film **battery**, comprising: preparing an **anode** film; preparing an electrolyte layer; preparing a cathode film; stacking the **anode** film, the electrolyte layer and the cathode layer, with each pair of adjacent layers being protected by shielding; and encapsulating the assembly.

USE - For preparing an **anode** film for thin film **battery** (claimed). The **anode** film is used in the manufacture process of integrated circuit.

ADVANTAGE - Produces **battery** with very long life time, high safety, high versatility in shape, low leakage rate and could be incorporated into integrated circuit or respective electronic components.

DESCRIPTION OF DRAWINGS - The figure shows the X-ray powder diffraction pattern of the Li₄Ti₅O₁₂ target.

TECHNOLOGY FOCUS:

INORGANIC CHEMISTRY - Preferred Component: The noble **metal** comprises silver, gold (preferably), platinum, palladium and their alloys or oxides. The LiMO layer is Li₄Ti₅O₁₂ layer. The buffer layer is a **metal** layer, preferably titanium layer.

Preferred Property: The thickness of the buffer layer is 10-1000Angstrom. The thickness of the noble **metal** layer is 20-5000Angstrom.

Preferred Method: The noble **metal** is sputtered onto the **substrate** above 20degreesC. The LiMO layer is sputtered onto the **substrate** above 300degreesC.

EXTENSION ABSTRACT:

DEFINITIONS - Preferred Definitions: Preferably, M = Ti, Co, Cr, Mo, Zr, W, alloys, or their oxides.

FILE SEGMENT: CPI; EPI
 MANUAL CODE: CPI: L02-A02B; L03-E01B8A; L03-E08B
 EPI: V05-F05E5; V05-F08D1A; X16-E01C1; X16-E02

L105 ANSWER 2 OF 19 WPIX COPYRIGHT 2006 THE THOMSON CORP on STN
 ACCESSION NUMBER: 2006-415244 [42] WPIX
 DOC. NO. CPI: C2006-131157 [42]
 DOC. NO. NON-CPI: N2006-343735 [42]
 TITLE: Depositing lithium cobalt oxide layer for
battery, by flowing gaseous mixture
 including argon and oxygen through reactor, and
 applying pulsed direct current power to target
 formed of lithium cobalt oxide positioned opposite
 the **substrate**
 DERWENT CLASS: L03; P42; X16
 INVENTOR: DEMARAY R E; SHAO M; ZHANG H
 PATENT ASSIGNEE: (DEMA-I) DEMARAY R E; (SHAO-I) SHAO M; (SYMM-N)
 SYMMORPHIX INC; (ZHAN-I) ZHANG H
 COUNTRY COUNT: 111

PATENT INFORMATION:

| PATENT NO | KIND | DATE | WEEK | LA | PG | MAIN IPC |
|----------------|------|----------|-----------|----|----|----------|
| WO 2006063308 | A2 | 20060615 | (200642)* | EN | 66 | [17] |
| US 20060134522 | A1 | 20060622 | (200642) | EN | | |

APPLICATION DETAILS:

| PATENT NO | KIND | APPLICATION | DATE |
|----------------|----------------|-----------------|----------|
| WO 2006063308 | A2 | WO 2005-US44781 | 20051207 |
| US 20060134522 | A1 Provisional | US 2004-634818P | 20041208 |
| US 20060134522 | A1 Provisional | US 2005-651363P | 20050208 |
| US 20060134522 | A1 | US 2005-297057 | 20051207 |

PRIORITY APPLN. INFO: US 2005-651363P 20050208
 US 2004-634818P 20041208
 US 2005-297057 20051207

INT. PATENT CLASSIF.:

IPC ORIGINAL: B05D0005-12 [I,A]; B05D0005-12 [I,A]; C23C0014-34
 [I,A]; H01M0010-36 [I,C]; H01M0010-38 [I,A];
 H01M0004-52 [I,A]; H01M0004-52 [I,A]

BASIC ABSTRACT:

WO 2006063308 A2 UPAB: 20060703
 NOVELTY - Lithium cobalt oxide layer is deposited by placing
 a **substrate** in a reactor, flowing a gaseous mixture
 including argon and oxygen through the reactor, and applying pulsed
 direct current power to a target formed of lithium cobalt oxide
 positioned opposite the **substrate**. A crystalline layer of
 lithium cobalt oxide is deposited over the **substrate**.

DETAILED DESCRIPTION - INDEPENDENT CLAIMS are also included
 for:

(a) **battery** structure, comprising a crystalline
 lithium cobalt oxide layer deposited over a low-temperature
substrate;

(b) a method of producing a **battery**, comprising
 loading a **substrate** into a cluster tool; depositing a
 crystalline lithium cobalt oxide layer over a conducting layer in a
 chamber of the cluster tool with a pulsed-direct current plasma

vapor deposition process; and

(c) a fixture for holding a thin **substrate**, comprising a top portion and a bottom portion, where the thin **substrate** is held when the top portion is attached to the bottom portion.

USE - For depositing a lithium cobalt oxide layer for a **battery** structure.

ADVANTAGE - Provide a low-temperature, high deposition rate deposition of a crystalline layer of LiCoO₂ with a desired (101) orientation. It also addresses the need for high rate deposition of LiCoO₂ films that can be utilized as the cathode layer in a solid state rechargeable lithium **battery**. It can eliminate the high temperature (more than 700 degrees C) anneal step that is conventionally needed to crystallize the LiCoO₂ layer.

DESCRIPTION OF DRAWINGS - The figure shows a thin-film **battery** design.

TECHNOLOGY FOCUS:

CERAMICS AND GLASS - Preferred Material: The **substrate** is a material from silicon, glasses, ceramics, or **metals**. It can be **metal** foil. The oxide layer is a silicon dioxide layer. The **metal** layer is iridium or platinum.

ELECTRICAL POWER AND ENERGY - Preferred Method: A radio frequency bias is applied to the **substrate**. The **substrate** is preheated to 200degreesC. An oxide layer is deposited on the **substrate**. The crystalline layer is deposited at a rate of greater than 1 microns/hr. The target is a ceramic lithium cobalt oxide sputter target with a resistance measured across 4 cm of surface of less than 500 k Ω . A **metal** layer is deposited on the **substrate**. The crystalline layer is annealed with a low thermal budget or to 700degreesC in a rapid thermal anneal process for less than 10 minutes. The lithium cobalt oxide layer is annealed at less than or equal to 500degreesC or less than or equal to 400degreesC. A conducting layer is deposited between the crystalline layer and the low-temperature **substrate**. The conducting layer is an iridium layer or a platinum layer. A LiPON layer is deposited over the lithium cobalt oxide layer. A second conducting layer is deposited over the lithium cobalt oxide layer. An **anode** layer is deposited over the LiPON layer. A top conducting layer is deposited over the **battery** stacks. The **battery** stacks form a parallel stacked **battery** structure or a series stacked **battery** structure. The conducting layer is a **metal** deposited on a **substrate**. Preferred Component: The **substrate** is a low temperature **substrate**. Preferred Property: The crystalline layer is (101) oriented or (003) oriented. A grain size of the crystalline layer is 750-1700Angstrom.

METALLURGY - Preferred Component: The conducting layer is a metallic foil formed of copper, gold, platinum, aluminum, stainless steel, or other or cobalt based super alloy. It is an iridium layer.

POLYMERS - Preferred Material: The **substrate** is a material from polymers.

FILE SEGMENT: CPI; GMPI; EPI
MANUAL CODE: CPI: L03-E01B8A
EPI: X16-E01C1

L105 ANSWER 3 OF 19 WPIX COPYRIGHT 2006 THE THOMSON CORP on STN
ACCESSION NUMBER: 2006-370931 [38] WPIX

MEI HUANG EIC1700 REM4B28 571-272-3952

06/12/2006

DOC. NO. CPI: C2006-119567 [38]
 TITLE: **Anode for lithium secondary battery** comprises **substrate** consisting of **metal** foil or **metal** film having specified average surface **roughness**, and a lithium layer coated on the **substrate**
 DERWENT CLASS: L03; X16
 INVENTOR: CHO C K; LEE J W
 PATENT ASSIGNEE: (SMSU-C) SAMSUNG SDI CO LTD
 COUNTRY COUNT: 1

PATENT INFORMATION:

| PATENT NO | KIND | DATE | WEEK | LA | PG | MAIN IPC |
|---------------|------|----------|-----------|----|-----|------------|
| KR 2005039774 | A | 20050429 | (200638)* | KO | [1] | H01M004-64 |

APPLICATION DETAILS:

| PATENT NO | KIND | APPLICATION | DATE |
|---------------|------|---------------|----------|
| KR 2005039774 | A | KR 2005-16541 | 20050228 |

PRIORITY APPLN. INFO: KR 2005-16541 20050228

INT. PATENT CLASSIF.:

MAIN: H01M004-64
 SECONDARY: H01M002-02

BASIC ABSTRACT:

KR 2005039774 A UPAB: 20060616
 NOVELTY - Provided is a **lithium secondary battery anode** that has a controlled range of average surface **roughness** on its **substrate**, to improve the life span of a **lithium secondary battery** using the **anode**
 DETAILED DESCRIPTION - The **anode** (10) for a **lithium secondary battery** comprises a **substrate** (20) consisting of **metal** foil or **metal** film having an average surface **roughness** of 30-3200 **Angstroms**; and a lithium layer (30) coated on the **substrate** (20). Particularly, the **substrate** is formed of a conductive material. The **lithium secondary battery** comprises the **anode** and a cathode comprising at least one cathode active material selected from the group consisting of lithium-containing **metal** oxides, lithium-containing chalcogenide compounds, sulfur-based materials, and **conductive polymers**.

FILE SEGMENT: CPI; EPI
 MANUAL CODE: CPI: L03-E01B8; L03-E01B9A; L03-E03
 EPI: X16-E01A1; X16-E01C; X16-E01C1; X16-E01E;
 X16-E02; X16-E08A

L105 ANSWER 4 OF 19 WPIX COPYRIGHT 2006 THE THOMSON CORP on STN

ACCESSION NUMBER: 2006-144259 [15] WPIX
 DOC. NO. CPI: C2006-048827 [15]
 DOC. NO. NON-CPI: N2006-124738 [15]
 TITLE: Improvement of life of thin film rechargeable **battery** for e.g. microelectronic devices and remote sensors, by applying planarization material over **anode** layer and thin film

DERWENT CLASS: **battery**, and applying barrier layer(s) to
planarization layer
INVENTOR: A85; L03; X16
PATENT ASSIGNEE: BATES J B
COUNTRY COUNT: (OAKR-N) OAK RIDGE MICRO-ENERGY INC
1

PATENT INFORMATION:

| PATENT NO | KIND | DATE | WEEK | LA | PG | MAIN IPC |
|------------|------|----------|-----------|----|----|----------|
| US 6994933 | B1 | 20060207 | (200615)* | EN | 10 | [7] |

APPLICATION DETAILS:

| PATENT NO | KIND | APPLICATION | DATE |
|------------|------|----------------|----------|
| US 6994933 | B1 | US 2002-244260 | 20020916 |

PRIORITY APPLN. INFO: US 2002-244260 20020916

INT. PATENT CLASSIF.:

IPC ORIGINAL: H01M0002-00 [I,A]; H01M0006-04 [I,C]; H01M0006-12
[I,A]; H01M0006-42 [I,C]; H01M0006-46 [I,A]

BASIC ABSTRACT:

US 6994933 B1 UPAB: 20060302

NOVELTY - Improvement of life of a thin film rechargeable **battery** (32), comprises applying a planarization material over an **anode** (24) layer and thin film **battery** to provide a relatively smooth, pinhole free planarization layer; and applying barrier layer(s) to the planarization layer, the barrier layers consisting of metal materials, ceramic materials, or polymeric materials.

DETAILED DESCRIPTION - Improvement of life of a thin film rechargeable **battery** having a solid electrolyte (22), comprises providing a thin film **battery** having an **anode** layer reactive with oxygen and water vapor; applying a planarization material over the **anode** layer and thin film **battery** to provide a relatively smooth, pinhole free planarization layer, where surface **roughness** of the planarization layer is not greater than 1.0 nm root mean square, and the planarization material in the planarization layer is non-reactive with the **anode** layer; and applying barrier layer(s) to the planarization layer, the barrier layers consisting of metal materials, ceramic materials, or polymeric materials, where planarization layer and barrier layer(s) provide a thin film **battery** having an extended life.

An INDEPENDENT CLAIM is also included for a long-life, thin film rechargeable **battery**, comprising a support **substrate** having a support surface; a cathode current collector (16) spaced-apart from an **anode** current collector (18) deposited on the support surface of the **substrate**; a cathode (20) layer deposited on a portion of the cathode current collector; a solid electrolyte layer deposited on the cathode material, **substrate**, and a first portion of the **anode** current collector; an **anode** layer deposited on the electrolyte layer, and a second portion of the **anode** current collector to provide a thin film **battery** stack; a planarization material applied over the thin film **battery** stack, to provide a relatively smooth planarization layer having a surface **roughness** of not

greater than 1.0 nm root mean square, and the planarization material in the planarization layer is nonreactive with the **anode** layer; and barrier layer(s) applied over the planarization layer, and consisting of metal materials, ceramic materials, or polymeric materials, where planarization layer and barrier layer(s) provide a thin film **battery** having an extended life.

USE - The method is for improvement of life of a thin film rechargeable **battery** (claimed) for microelectronic devices and circuits, implantable medical devices, remote sensors, miniature transmitters, smart cards, and micro electro mechanical systems devices. The thin film rechargeable **battery** is used for e.g. PCMCIA (sic) cards and other types of complementary MOS-static RAM devices.

ADVANTAGE - The method provides a thin film **battery** having an extended life or a life approaching 20 years.

DESCRIPTION OF DRAWINGS - The figure is a cross-sectional view, not to scale, of a thin-film **battery** containing a planarization/barrier layer.

Cathode current collector (16)

Anode current collector (18)

Cathode (20)

Solid electrolyte (22)

Anode (24)

Thin film **battery** (32)

TECHNOLOGY FOCUS:

METALLURGY - Preferred Method: The method comprises applying a metal layer to the **anode** layer before applying the planarization material to the **anode** layer and thin film **battery**, where metal layer is provided by a metal that does not alloy with the **anode** layer; depositing a layer of lithium phosphorus oxynitride on the metal layer before applying the planarization material to the **anode** layer and thin film **battery**; depositing magnesium over the planarization layer to provide a getter layer reactive with oxygen and water (H₂O).

POLYMERS - Preferred Material: The planarization material is acrylates, diacrylates, triacrylates, or **polyolefins** that do not contain an organic acid group. Preferred Parameter: The planarization layer has a flatness not greater than 0.005 cm/in.

FILE SEGMENT: CPI; EPI
MANUAL CODE: CPI: A12-E06; L03-E01D
EPI: X16-B01F; X16-F09

L105 ANSWER 5 OF 19 WPIX COPYRIGHT 2006 THE THOMSON CORP on STN
ACCESSION NUMBER: 2005-383313 [39] WPIX
CROSS REFERENCE: 2005-364901; 2005-364978
DOC. NO. CPI: C2005-118514 [39]
DOC. NO. NON-CPI: N2005-310653 [39]
TITLE: Fabrication of carbon-based cathode for electrochemical cell, comprises emitting droplet(s) in form of mist of electrode coating fluid onto portion of titanium **substrate** from at least one orifice of actuated valve
DERWENT CLASS: A85; L03; X16
INVENTOR: HOSSICK-SCHOTT J; KEITEL O; KRUGER F; SPECHT H
PATENT ASSIGNEE: (HOSS-I) HOSSICK-SCHOTT J; (KEIT-I) KEITEL O; (KRUG-I) KRUGER F; (SPEC-I) SPECHT H; (MEDT-C) MEDTRONIC INC
COUNTRY COUNT: 109

PATENT INFORMATION:

| PATENT NO | KIND | DATE | WEEK | LA | PG | MAIN IPC |
|----------------|------|----------|-----------|----|--------|------------|
| US 20050098242 | A1 | 20050512 | (200539)* | EN | 14 [9] | C25B011-04 |
| WO 2006014991 | A2 | 20060209 | (200612) | EN | | |

APPLICATION DETAILS:

| PATENT NO | KIND | APPLICATION | DATE |
|----------------|----------------|-----------------|----------|
| US 20050098242 | A1 Provisional | US 2003-514371P | 20031023 |
| US 20050098242 | A1 Provisional | US 2003-514372P | 20031023 |
| US 20050098242 | A1 | US 2004-903685 | 20040730 |
| WO 2006014991 | A2 | WO 2005-US26552 | 20050727 |

PRIORITY APPLN. INFO: US 2004-903685 20040730
 US 2003-514371P 20031023
 US 2003-514372P 20031023

INT. PATENT CLASSIF.:

MAIN: C25B011-04

IPC ORIGINAL: H01G0009-058 [I,A]; H01M0004-04 [I,A]

BASIC ABSTRACT:

US 20050098242 A1 UPAB: 20051222

NOVELTY - Fabrication of cathode, comprises emitting droplet(s) in the form of a mist of an electrode coating fluid (25) onto a portion of a titanium **substrate** (20) from at least one orifice of an actuated valve.

DETAILED DESCRIPTION - An INDEPENDENT CLAIM is also included for an apparatus for fabricating a carbon-based cathode for electrochemical cell, comprising:

(1) mechanism for emitting droplet(s) in the form of a mist of a carbon-bearing electrode coating fluid onto a portion of a titanium **substrate** from at least one orifice of an actuated valve;

(2) mechanism for heating the deposited material and the titanium **substrate** at 600-1000degreesC at a reduced pressure and/or under a chemically inert cover gas to form a titanium carbide layer at interface of the titanium and the carbon material; and

(3) mechanism for activating the deposited carbon material by heating in an oxygen-containing atmosphere for 0.1-4 hours at 200-500degreesC.

USE - The method is for fabricating a carbon-based cathode for an electrochemical cell e.g. **battery** (claimed), used for high energy density capacitors. The cathode is useful in implantable cardioverter-defibrillators.

ADVANTAGE - The cathodes can be efficiently mass-produced so that they inhabit a pre-existing metallic surface such as an inner surface of a titanium casing adjacent to but insulated from direct electrical communication with an **anode**. A balanced high-density electrolytic capacitor can be realized. The capacitors have a robust high-capacitance cathode, and exhibit reduced equivalent series resistance (ESR).

DESCRIPTION OF DRAWINGS - The figure is a perspective view of a system for depositing a cathode onto a continuous roll of titanium **substrate**.

Titanium **substrate** (20)

Coating fluid (25)

TECHNOLOGY FOCUS:

ELECTRICAL POWER AND ENERGY - Preferred Component: The **substrate** comprises a pre-processed **substrate** having a region of **roughened** surface features. The dielectric separator material comprises at least two discrete layers of dielectric separator material.

INORGANIC CHEMISTRY - Preferred Method: The method further comprises post-processing the electrode coating fluid; and reciprocating the valve(s) in proximity with the **substrate** during the emitting step. The post-processing consists of heating the deposited material and the titanium **substrate** at 600-1000degreesC at a reduced pressure and/or under a chemically inert cover gas to form a titanium carbide layer at interface of the titanium and the carbon material; and activating the deposited carbon material by heating in an oxygen-containing atmosphere for 0.1-4 hours at 200-500degreesC. Post-processing consists of heating the coated surface to 350degreesC in air for 1 hour. The method further comprises emitting the electrode coating fluid material on opposing major surfaces of the sheet of titanium; cutting the thin sheet of titanium into smaller units; and covering the cathode with a dielectric separator material. **Preferred Parameter:** The deposited and processed electrode coating fluid material comprises consistent layer of material having a depth of 1-40 microns. **Preferred Composition:** The electrode coating fluid material comprises a material having a solids content of 2-20%. **Preferred Component:** The electrode coating fluid material comprises a relatively high viscosity paste material. The electrode coating fluid consists of a carbon bearing slurry. The electrode coating fluid contains oxides of any metal included in one or more of Group VII and Group VIII of the periodic table or chemical precursors for such oxides, e.g. chlorides or nitrides. The metal oxides and corresponding chemical precursors include ruthenium dioxide (RuO₂), together with the oxide precursor ruthenium chloride (RuCl₃), iridium dioxide (IrO₂), manganese dioxide (MnO₂) together with the oxide precursor manganese nitride (Mn(NO₃)₂), silver vanadium oxide (Ag₂V₄O₁₁), vanadium pentoxide (V₂O₅), titanium dioxide (TiO₂), rhenium dioxide (ReO₂), osmium dioxide (OsO₂), molybdenum dioxide (MoO₂), rhodium dioxide (RhO₂), vanadium dioxide (VO₂), or tungsten dioxide (WO₂). The electrode coating fluid contains RuCl₃ dissolved in iso-propyl alcohol. The titanium **substrate** comprises an interior portion of an electrochemical cell housing. The titanium **substrate** comprises a portion of a sheet of titanium or a portion of a rolled-sheet of titanium.

ORGANIC CHEMISTRY - Preferred Method: The method further comprises post-processing the electrode coating fluid; and reciprocating the valve(s) in proximity with the **substrate** during the emitting step. The post-processing consists of heating the deposited material and the titanium **substrate** at 600-1000degreesC at a reduced pressure and/or under a chemically inert cover gas to form a titanium carbide layer at interface of the titanium and the carbon material; and activating the deposited carbon material by heating in an oxygen-containing atmosphere for 0.1-4 hours at 200-500degreesC. Post-processing consists of heating the coated surface to 350degreesC in air for 1 hour. The method further comprises emitting the electrode coating fluid material on opposing major surfaces of the sheet of titanium; cutting the thin sheet of titanium into smaller units; and covering the cathode with a dielectric separator material. **Preferred Parameter:** The deposited and processed electrode coating fluid material comprises consistent layer of material having a depth of 1-40 microns. **Preferred Composition:** The electrode coating fluid material comprises a

material having a solids content of 2-20%. Preferred Component: The electrode coating fluid material comprises a relatively high viscosity paste material. The electrode coating fluid consists of a carbon bearing slurry. The electrode coating fluid contains oxides of any metal included in one or more of Group VII and Group VIII of the periodic table or chemical precursors for such oxides, e.g. chlorides or nitrides. The metal oxides and corresponding chemical precursors include ruthenium dioxide (RuO₂), together with the oxide precursor ruthenium chloride (RuCl₃), iridium dioxide (IrO₂), manganese dioxide (MnO₂) together with the oxide precursor manganese nitride (Mn(NO₃)₂), silver vanadium oxide (Ag₂V₄O₁₁), vanadium pentoxide (V₂O₅), titanium dioxide (TiO₂), rhenium dioxide (ReO₂), osmium dioxide (OsO₂), molybdenum dioxide (MoO₂), rhodium dioxide (RhO₂), vanadium dioxide (VO₂), or tungsten dioxide (WO₂). The electrode coating fluid contains RuCl₃ dissolved in iso-propyl alcohol. The titanium **substrate** comprises an interior portion of an electrochemical cell housing. The titanium **substrate** comprises a portion of a sheet of titanium or a portion of a rolled-sheet of titanium.

POLYMERS - Preferred Component: The dielectric separator material comprises polyurethane material or **polypropylene** material. The actuated valve fluid couples to a major reservoir containing a volume of the electrode coating fluid.

FILE SEGMENT: CPI; EPI
MANUAL CODE: CPI: A12-E09; L03-E01B3
EPI: X16-E01G

L105 ANSWER 6 OF 19 WPIX COPYRIGHT 2006 THE THOMSON CORP on STN
ACCESSION NUMBER: 2005-364906 [37] WPIX
DOC. NO. CPI: C2005-112003 [37]
DOC. NO. NON-CPI: N2005-295719 [37]
TITLE: Rechargeable **lithium** polymer
battery used as power source for portable
electronics, comprises **negative**
electrode deposited on **substrate**,
positive electrode, and polymer electrolyte
comprising lithium salt, organic solvent, and
polymer
DERWENT CLASS: A18; A28; A85; L03; P11; X16
INVENTOR: CHO C; CHO C K; CHOI Y; HWANG D; HWANG D C; LEE S;
RI S; CHOI Y S; LEE S M
PATENT ASSIGNEE: (CHOC-I) CHO C; (CHOI-I) CHOI Y; (HWAN-I) HWANG D;
(LEES-I) LEE S; (SMSU-C) SAMSUNG DENKAN KK;
(SMSU-C) SAMSUNG SDI CO LTD
COUNTRY COUNT: 4

PATENT INFORMATION:

| PATENT NO | KIND | DATE | WEEK | LA | PG | MAIN IPC |
|----------------|------|----------|-----------|----|--------|------------|
| US 20050089759 | A1 | 20050428 | (200537)* | EN | 13 [1] | |
| JP 2005129535 | A | 20050519 | (200538) | JA | 34 | H01M010-40 |
| KR 2005038905 | A | 20050429 | (200637) | KO | | H01M004-02 |
| CN 1770540 | A | 20060510 | (200657) | ZH | | H01M010-36 |

APPLICATION DETAILS:

| PATENT NO | KIND | APPLICATION | DATE |
|----------------|------|----------------|----------|
| US 20050089759 | A1 | US 2004-970824 | 20041021 |

KR 2005038905 A
JP 2005129535 A
CN 1770540 A

KR 2003-74218 20031023
JP 2004-308718 20041022
CN 2004-10104729 20041025

PRIORITY APPLN. INFO: KR 2003-74218 20031023

INT. PATENT CLASSIF.:

MAIN: H01M010-40; H01M004-02

SECONDARY: H01M004-38; H01M004-40; H01M004-48; H01M004-58;
H01M004-60; H01M004-66

IPC ORIGINAL: H01M0010-36 [I,C]; H01M0010-40 [I,A]; H01M0004-02
[I,A]; H01M0004-38 [I,A]; H01M0004-58 [I,A];
H01M0004-64 [I,A]; H01M0004-66 [I,A]

IPC RECLASSIF.: H01M0010-36 [I,C]; H01M0010-40 [I,A]; H01M0002-16
[I,A]; H01M0002-16 [I,C]; H01M0004-02 [I,A];
H01M0004-02 [I,C]; H01M0004-36 [I,C]; H01M0004-38
[I,A]; H01M0004-38 [I,C]; H01M0004-40 [I,A];
H01M0004-40 [I,C]; H01M0004-48 [I,A]; H01M0004-48
[I,C]; H01M0004-58 [I,A]; H01M0004-58 [I,C];
H01M0004-60 [I,A]; H01M0004-66 [I,A]; H01M0004-66
[I,C]

BASIC ABSTRACT:

US 20050089759 A1 UPAB: 20051222

NOVELTY - A rechargeable **lithium** polymer

battery comprises **negative electrode**

(2) comprising negative active material layer deposited on a
substrate; positive electrode (3) comprising positive
active material; and polymer electrolyte comprising lithium salt,
organic solvent, and polymer.

USE - Used as power sources for portable electronics.

ADVANTAGE - The rechargeable **lithium** polymer

battery exhibits improved cycle life characteristics.

DESCRIPTION OF DRAWINGS - The figure is a schematic view of
the structure of **lithium** secondary **battery**.

Negative electrode (2)

Positive electrode (3)

Separator (4)

Battery case (5)

Sealing portion (6)

TECHNOLOGY FOCUS:

ELECTRICAL POWER AND ENERGY - Preferred Component: The
substrate includes current collector, supporting polymer
film, or a current collector deposited on a supporting polymer
film. The **substrate** is a current collector deposited on a
supporting polymer film to a thickness of 50-30000, most preferably
75-10000Angstrom. The rechargeable **lithium**
polymer **battery** further includes a silicon-included
releasing layer. The negative active material layer further
comprises a protection layer on its surface. The protection layer
comprises polymer material and/or inorganic material. The positive
active material is a compound capable of reversibly intercalating
or deintercalating lithium ions. The polymer electrolyte is
prepared by assembling a **battery** using an electrolyte
precursor solution obtained from addition of a polymer-forming
compound and an initiator to an electrolytic solution comprising a
non-aqueous organic solvent and a lithium salt; and polymerizing
the **battery** at a temperature at which it starts
polymerization. The rechargeable **lithium** polymer
battery further comprises an initiator that decomposes to
generate nitrogen oxide or carbon dioxide. Preferred Property:
The negative active material layer has a thickness of 1-100,

preferably 2-90microns.

INORGANIC CHEMISTRY - Preferred Component: The protection layer comprises an inorganic material consisting of lithium phosphorus oxynitride, lithium carbonate, lithium nitride, lithium phosphate, or lithium (IV) phosphate. The positive active material comprises compounds of formula LiAO_2 ; lithium permanganate; LiANibBcMdO_2 (where $a=0.95-1.1$, $b=0-0.9$, $c=0-0.5$, and $d=0.001-0.1$); LiANibCocMndMeO_2 (where $a=0.95-1.1$, $b=0-0.9$, $c=0-0.5$, $d=0-0.5$, and $e=0.001-0.1$); LiAMbO_2 (where $a=0.95-1.1$, $b=0.001-0.1$); $\text{LiAMn}_2\text{MbO}_4$ (where $a=0.95-1.1$, and $b=0.001-0.1$); DS_2 ; LiDS_2 ; vanadium oxide; lithium vanadate, LiEO_2 ; lithium nickel vanadate; $\text{Li}(3-x)\text{F}_2(\text{PO}_4)_3$ (where $x=0-3$); $\text{Li}(3-x)\text{Fe}_2(\text{PO}_4)_3$ (where $x=0-2$). It may comprise inorganic sulfur, Li_2Sn (where n is greater than or equal to 1). The lithium salt comprises lithium phosphorus hexafluoride, lithium boron tetrafluoride, lithium arsenic hexafluoride, lithium chlorate, LiCF_3SO_3 , $\text{Li}(\text{CF}_3\text{SO}_2)_2\text{N}$, $\text{LiN}(\text{SO}_2\text{C}_2\text{F}_5)_2$, lithium antimony hexafluoride, $\text{LiN}(\text{CF}_3\text{SO}_2)_3$, $\text{LiC}_4\text{F}_9\text{SO}_3$, lithium aluminate, lithium aluminum tetrachloride, $\text{LiN}(\text{CxF}_2\text{x}+\text{ISO}_2)(\text{CxF}_2\text{y}+\text{ISO}_2)$ (where x and y are natural numbers), lithium chloride, and/or lithium iodide.

A=Co, No, or Mn;

B=Co or Mn;

D=Ti or Mo;

E=Cr, V, Fe, Sc, or Y;

F=V, Cr, M, Co, Ni, or Cu; and

M=transition metals, Al, Cr, Mn, Fe, Mg, La, Ce,

Sr, and/or V.

Preferred Property: The inorganic material has a thickness of 10-20000Angstrom.

METALLURGY - Preferred Material: The current collector includes nickel, titanium, copper, silver, gold, platinum, iron, cobalt, chromium, tungsten, molybdenum, aluminum, magnesium, potassium, sodium, calcium, strontium, barium, silicon, germanium, antimony, lead, and/or indium. The negative active material includes lithium metal or its alloy, or a material capable of reversibly forming a compound with lithium. It preferably includes aluminum, magnesium, potassium, sodium, calcium, strontium, barium, silicon, germanium, antimony, lead, indium, or zinc.

ORGANIC CHEMISTRY - Preferred Component: The protection layer comprises an inorganic material consisting of lithium phosphorus oxynitride, lithium carbonate, lithium nitride, lithium phosphate, or lithium (IV) phosphate. The positive active material comprises compounds of formula LiAO_2 ; lithium permanganate; LiANibBcMdO_2 (where $a=0.95-1.1$, $b=0-0.9$, $c=0-0.5$, and $d=0.001-0.1$); LiANibCocMndMeO_2 (where $a=0.95-1.1$, $b=0-0.9$, $c=0-0.5$, $d=0-0.5$, and $e=0.001-0.1$); LiAMbO_2 (where $a=0.95-1.1$, $b=0.001-0.1$); $\text{LiAMn}_2\text{MbO}_4$ (where $a=0.95-1.1$, and $b=0.001-0.1$); DS_2 ; LiDS_2 ; vanadium oxide; lithium vanadate, LiEO_2 ; lithium nickel vanadate; $\text{Li}(3-x)\text{F}_2(\text{PO}_4)_3$ (where $x=0-3$); $\text{Li}(3-x)\text{Fe}_2(\text{PO}_4)_3$ (where $x=0-2$). It may comprise inorganic sulfur, Li_2Sn (where n is greater than or equal to 1). The lithium salt comprises lithium phosphorus hexafluoride, lithium boron tetrafluoride, lithium arsenic hexafluoride, lithium chlorate, LiCF_3SO_3 , $\text{Li}(\text{CF}_3\text{SO}_2)_2\text{N}$, $\text{LiN}(\text{SO}_2\text{C}_2\text{F}_5)_2$, lithium antimony hexafluoride, $\text{LiN}(\text{CF}_3\text{SO}_2)_3$, $\text{LiC}_4\text{F}_9\text{SO}_3$, lithium aluminate, lithium aluminum tetrachloride, $\text{LiN}(\text{CxF}_2\text{x}+\text{ISO}_2)(\text{CxF}_2\text{y}+\text{ISO}_2)$ (where x and y are natural numbers), lithium chloride, and/or lithium iodide.

A=Co, No, or Mn;

B=Co or Mn;

D=Ti or Mo;

E=Cr, V, Fe, Sc, or Y;

F=V, Cr, M, Co, Ni, or Cu;and
M=transition metals, Al, Cr, Mn, Fe, Mg, La, Ce,
Sr, and/or V.

Preferred Property: The inorganic material has a thickness of 10-20000Angstrom.

ORGANIC CHEMISTRY - Preferred Component: The initiator includes diacyl peroxides consisting of dibenzoyl peroxide, succinic peroxide, dilauroyl peroxide, and didecanoyl peroxide; dialkyl peroxides selected from the group consisting of dicumyl peroxide, di-t-butyl peroxide and 2,5-dimethyl-2,5-di-(t-butylperoxy) hexane; peroxy esters selected from the group consisting of (alpha-cumyl peroxy-neodecanoate, 1,1-dimethyl-3-hydroxybutyl peroxy-2ethylhexanoate, and t-butyl peroxy pivalate; tertiary alkyl hydroperoxides selected from the group consisting of 2,5dihydroperoxy-2,5-dimethylhexane, cumene hydroperoxide, and t-butyl hydroperoxide; peroxy ketals consisting of 2,2-di-(t-butylperoxy)butane and ethyl 3,3-di-(t-butylperoxy)butylate; peroxydicarbonates selected from the group consisting of di(n-propyl)peroxy dicarbonate, di(sec-butyl)peroxy dicarbonate, and di(2-ethylhexyl)peroxy dicarbonate; or azos comprising azobisisobutyronitrile. The organic solvent comprises benzene, toluene, fluorobenzene, 1,2-difluorobenzene, 1,3-difluorobenzene, 1,4-difluorobenzene, 1,2,3trifluorobenzene, 1,2,4-trifluorobenzene, chlorobenzene, 1,2-dichlorobenzene, 1,3-dichlorobenzene, 1,4-dichlorobenzene, 1,2,3-trichlorobenzene, 1,2,4-trichlorobenzene, iodobenzene, 1,2-diiodobenzene, 1,3-diiodobenzene, 1,4-diiodobenzene, 1,2,3-triiodobenzene, 1,2,4-triiodobenzene, fluorotoluene, 1,2-difluorotoluene, 1,3-difluorotoluene, 1,4-difluorotoluene, 1,2,3-trifluorotoluene, 1,2,4-trifluorotoluene, chlorotoluene, 1,2-dichlorotoluene, 1,3-dichlorotoluene, 1,4-dichlorotoluene, 1,2,3-trichlorotoluene, 1,2,4-trichlorotoluene, iodotoluene, 1,2-diiodotoluene, 1,3-diiodotoluene, 1,4-diiodotoluene, 1,2,3-triiodotoluene, 1,2,4-triiodotoluene, RCN (where R is 2-50C cyclic hydrocarbon, and may include double bonds, aromatic rings, or ether bonds), dimethoxyformamide, methylacetate, xylene, cyclohexane, tetrahydrofuran, 2-methyltetrahydrofuran, cyclohexanone, ethanol, isopropyl alcohol, dimethyl carbonate, ethyl methyl carbonate, diethyl carbonate, methylpropyl carbonate, methyl propionate, ethyl propionate, methyl acetate, ethyl acetate, propyl acetate, dimethoxyethane, 1,3-dioxolane, diglyme, tetraglyme, ethylene carbonate, propylene carbonate, gamma-butyrolactone, valerolactone, decanolide, mevalolactone, and/or sulfolane.

POLYMERS - Preferred Component: The **substrate** comprises a supporting polymer film with an m.pt. of greater than or equal to 80degreesC and consisting of **polyethylene** terephthalate, polyimide, polytetrafluoroethylene, **polyethylene** naphthalate, **polypropylene**, **polyethylene**, **polyester**, polyvinylidene fluoride, or polysulfone. The protection layer comprises a polymer layer comprising a polymer consisting of polyvinylidene fluoride, copolymer of polyvinylidene fluoride and hexafluoropropylene, poly(vinyl acetate), poly(vinyl butyral-co-vinyl alcohol-co-vinyl acetate), poly(methylmethacrylate-co-ethyl acrylate), polyacrylonitrile, polyvinyl chloride-co-vinyl acetate, polyvinyl alcohol, poly(1-vinylpyrrolidone-co-vinyl acetate), cellulose acetate, polyvinyl pyrrolidone, **polyacrylate**, **polymethacrylate**, **polyolefin**, polyurethane, polyvinyl ether, acrylonitrile-butadiene rubber, styrene-butadiene rubber, acrylonitrile-butadiene-styrene, sulfonated

styrene/ethylene-butylene/styrene triblock polymer, and/or **polyethylene** oxide. The positive active material may comprise carbon-sulfur polymers of formula $(C_2S_x)_n$ (where $x=2.5-50$ and $n=\text{greater than or equal to } 2$). The polymer-forming compound has carbon-carbon double bond(s) at the end of the polymer-forming compound. It comprises multifunctional **acrylates** ((**poly**(ester)(metha)(**acrylate**) in which hydroxide groups in (**polyester** polyol) are partially or totally substituted with (meth)**acrylic ester**), **poly**(ethyleneglycol) dimethacrylate, **poly**(ethyleneglycol) diacrylate, **poly**(ethyleneglycol) divinylether ethylene glycol dimethacrylate, ethyleneglycol diacrylate, ethyleneglycol divinyl ether hexanediol diacrylate, tripropyleneglycol diacrylate, tetraethyleneglycol monoacrylate, and/or caprolactone acrylate. It may comprise compounds of formulae $R_a-OCH_2Q-CH_2O-CH_2Q_1-CH_2OR_e$; $CH_2=C(R_5)C(=O)O(CH_2C(R_6)HO)nC(=O)C(R_5=CH_2$; or $CH_2+C(R_5)C(=O)O(CH_2C(R_6)HO)nCH_3$. It is **polyester** polyol with a number-average molecular weight of 150-100000, and with 5-500 hydroxide groups. The **polyester** polyol is obtained from condensation polymerization of hydroxyl carboxylic acid of formula HOR_7COOH , from opening polymerization of a lactone of formula (20), or from condensation polymerization of a glycol of formula HOR_9OH and a dicarboxylic acid of formula $HOOCR_{10}COOH$. The glycol is ethylene glycol or diethylene glycol, and the dicarboxylic acid is adipic acid or succinic acid.

$Q=C(CH_2OR_c)(CH_2OR_b)$;

$Q_1=C(CH_2OR_f)(CH_2OR_d)$;

$R_a-R_f=(C(C(=O)H_2)SO C(=O)CH=CH_2)$ or $(C(=O)(CH_2)_3CH_2)$;

$R_5, R_6=H$ or CH_3 ;

$n=1-100000$;

$R_7=1-17C$ alkylene;

$R_8=2-20C$ alkylene;

$R_9=2-50C$ hydrocarbon including double bond, aromatic rings, or ether bonds; and

$R_{10}=1-20C$ cyclic hydrocarbon including double bond, aromatic rings, and ether bonds.

Preferred Property: The supporting polymer film has a thickness of 1-200, most preferably 3-50microns. The polymer material has a thickness of **100Angstrom** to 10microns.

Preferred Composition: The polymer-forming compound and the electrolyte are provided in a weight ratio of 1:1-1:1000, preferably 1:5-1:200. The polymer-forming compound and the initiator are provided in a weight ratio of 1:0.0001-1:0.5, preferably 1:0.001 to 1:0.2.

EXTENSION ABSTRACT:

EXAMPLE - A lithium cell with a capacity of 650 mAh was fabricated by assembling the cell using a positive electrode, a **negative electrode**, and an electrolyte precursor. The positive electrode was prepared by mixing lithium cobaltate positive active material, polyvinylidene fluoride binder, and a Super-P conductive agent in an N-methyl pyrrolidone solvent at a weight ratio of 94:3:3 to prepare positive active material slurry. The slurry was coated on an aluminum current collector and dried followed by pressing, thus obtaining a positive electrode. The **negative electrode** was prepared by depositing copper with a thickness of **10000Angstrom** on both sides of a **polyethylene** terephthalate film with a thickness of 15microns. After which lithium with a thickness of 20microns was deposited on both sides of the copper-deposited **polyethylene** terephthalate film to produce a

negative electrode. The assembled cell was allowed to stand at 75degreesC for 4 hours. During the standing step, the electrolyte precursor solution was polymerized and hardened to produce a gel polymer electrolyte.

FILE SEGMENT: CPI; GMPI; EPI
 MANUAL CODE: CPI: A12-E06; A12-M01; A12-M02; L03-E03
 EPI: X16-B01F1C; X16-E01C; X16-E02

L105 ANSWER 7 OF 19 WPIX COPYRIGHT 2006 THE THOMSON CORP on STN
 ACCESSION NUMBER: 2005-240600 [25] WPIX
 CROSS REFERENCE: 2005-416391; 2006-576884
 DOC. NO. CPI: C2005-076558 [25]
 DOC. NO. NON-CPI: N2005-198295 [25]
 TITLE: Catalysts composition for electrochemical catalyst used in fuel cells e.g. polymer electrolyte membrane fuel cells, for making stacks for electrical device and **battery** replacement, has carbon fibers bearing nanoparticles e.g. nanotubes
 DERWENT CLASS: A85; L02; L03; P42; X16
 INVENTOR: DONG Y; LI Y; WANG N
 PATENT ASSIGNEE: (INTE-N) INTEMATIX CORP
 COUNTRY COUNT: 1

PATENT INFORMATION:

| PATENT NO | KIND | DATE | WEEK | LA | PG | MAIN | IPC |
|----------------|------|----------|-----------|----|----|------|-----|
| US 20050053826 | A1 | 20050310 | (200525)* | EN | 32 | [14] | |

APPLICATION DETAILS:

| PATENT NO | KIND | APPLICATION | DATE |
|----------------|----------------|-----------------|----------|
| US 20050053826 | A1 Provisional | US 2003-501158P | 20030908 |
| US 20050053826 | A1 Provisional | US 2004-549712P | 20040302 |
| US 20050053826 | A1 | US 2004-823088 | 20040412 |

PRIORITY APPLN. INFO: US 2004-823088 20040412
 US 2003-501158P 20030908
 US 2004-549712P 20040302

INT. PATENT CLASSIF.:

IPC RECLASSIF.: B01J0021-00 [I,C]; B01J0021-18 [I,A]; B01J0023-42 [I,A]; B01J0023-42 [I,C]; B05D0005-12 [I,A]; B05D0005-12 [I,C]; H01B0001-00 [I,A]; H01B0001-00 [I,C]; H01B0001-04 [I,A]; H01B0001-04 [I,C]; H01M0004-88 [I,A]; H01M0004-88 [I,C]; H01M0004-90 [I,A]; H01M0004-90 [I,C]; H01M0004-92 [I,A]; H01M0004-96 [I,A]; H01M0004-96 [I,C]; H01M0008-10 [I,A]; H01M0008-10 [I,C]

BASIC ABSTRACT:

US 20050053826 A1 UPAB: 20060122
 NOVELTY - A catalysts composition comprises carbon fibers bearing nanoparticles.
 DETAILED DESCRIPTION - INDEPENDENT CLAIMS are also included for:
 (A) a fuel cell catalyst comprising nanoparticles coated with continuous thin film comprising platinum (Pt) or a Pt alloy;
 (B) an electrode-membrane combination comprising a first conductive electrode comprising a first fuel cell catalyst; a

second conductive electrode comprising a second fuel cell catalyst; and a proton exchange membrane separating the first conductive electrode and the second conductive electrode;

(C) a fuel cell stack comprising electrically connected electrode membrane combinations;

(D) an electrical device, particularly transportation device, comprising the fuel cell stack;

(E) a **battery** replacement comprises a container containing a fuel cell stack and providing a positive electrode terminal and a **negative electrode** terminal for contacting to a device requiring electricity;

(F) a method of fabricating a fuel catalyst, comprising providing nanoparticles; and depositing on the nanoparticles a continuous thin film comprising Pt or Pt alloy;

(G) a method of preparing a fuel cell element, comprising providing fibers and/or a porous electrode material; depositing a nanoparticle catalyst on the fibers and/or porous electrode material; forming nanoparticles on the fibers and/or porous electrode material using the nanoparticles catalyst; and forming a catalytically active layer comprising continuous thin film on the nanoparticles thus forming a fuel cell element comprising fibers bearing nanoparticles partially or fully coated with a catalytically active thin film;

(H) a method of making a carbon nanotube for use in a fuel cell, comprising providing a nanotube growth catalyst; and forming a carbon nanotube on the catalyst; and

(I) a carbon nanotube, comprising a nanotube growth catalyst.

USE - The catalysts composition for electrochemical catalyst used in fuel cells e.g. polymer electrolyte membrane fuel cells. The fuel cells are used for making stacks for electrical device, particularly transportation device, and for **battery** replacement. The **battery** replacement powers a home, a cell phone, a lighting system, a computer and/or an appliance (all claimed).

ADVANTAGE - The catalyst composition reduces the platinum content and improves the catalytic efficiency.

DESCRIPTION OF DRAWINGS - The figure shows a detailed structure of catalyst thin film/carbon nanotubes layer/carbon fiber sheet.

TECHNOLOGY FOCUS:

INORGANIC CHEMISTRY - Preferred Component: The nanoparticles are nanotubes, nanofibers, nanohorns, nanopowders, nanospheres, or quantum dots. The nanoparticles are carbon nanotubes. The carbon fibers comprise a porous electrode and carbon paper. The carbon nanotubes are seeded with one or more catalysts from $\text{Co}_{1-x}\text{Mox}$ (1); $\text{Co}_{1-x-y}\text{Ni}_x\text{Moy}$ (2); $\text{Co}_{1-x-yz}\text{Ni}_x\text{VyCr}_z$ (3); $\text{Ni}_{1-x-y}\text{MoxAl}_y$ (4); or $\text{Co}_{1-x-y}\text{Ni}_x\text{Al}_y$ (5). The carbon nanotubes are seeded with $\text{Co}_{8.8}\text{M}_{-1.2}$, $\text{Co}_{2.2}\text{Ni}_{5.6}\text{Mo}_{2.2}$, $\text{Co}_{5.7}\text{Ni}_{2.1}\text{V}_{1.1}\text{Cr}_{1.1}$, $\text{Ni}_{8}\text{Mo}_{1}\text{Al}_1$, or $\text{Co}_{6.4}\text{Ni}_{2.4}\text{Al}_{1.2}$. The nanoparticles are attached, or incorporated into, a porous carbon **substrate**, porous electrically **conducting substrate**, or **polymer substrate**. The nanoparticles are electrically coupled to an electrode. The first fuel cell catalyst and the second fuel cell catalyst are the same materials. The proton exchange membrane comprises Nafion, silicon oxide Nafion composite, polyphosphazenes (PPO), sulfonated PPO, or silica-polymer composites. The first conductive layer and first fuel cell catalyst further include a microdiffusion layer between the electrode and the catalyst. The first conductive electrode and the first fuel cell catalyst form an

integral single layer. The first fuel cell catalyst and the second fuel cell catalyst each additionally acts as a microdiffusion layer. The second conductive electrode and the second fuel cell catalyst also form an integral single layer.

x (for (1))=0-0.3;
 x (f(2))=0.1-0.7;
 y (for (2))=0-0.3;
 x (for (3) and (5))=0-0.7;
 y,z (for (3) and (5))=0-0.2;
 x,y (for (4))=0-0.2.

Preferred Parameter: The nanoparticles are nanotubes having a length of less than 50 microns, a width less than 100 nm, and a diameter of 50-100 nm. The proton exchange membrane has a thickness of 2-100 microns.

Preferred Method: The depositing is sputtering deposition, chemical vapor deposition (CVD), molecular beam epitaxy (MBE), plasma-assisted vapor deposition, or electron beam evaporation deposition.

METALLURGY - Preferred Component: The thin film partially covers the nanoparticles. The nanoparticles are fully coated with the thin film. The thin film comprises an alloy comprising Pt, vanadium (V), and one or more of cobalt, nickel (Ni), molybdenum, tantalum, tungsten, and zirconium. The thin film comprises an alloy of formula $Pt_xV_yCo_zNi_w$.

x=0.06-1 (preferably 0.012);
 y=0.07;
 z=0.56;
 w=0.25;
 x+y+z+w=1.

Preferred Parameter: The thin film has a thickness of 1-1,000 (preferably 5-100) **Angstrom**.

Preferred Composition: Platinum comprises up to 50% (preferably up to 12%) (mol. ratio or atomic%) of the alloy.

ORGANIC CHEMISTRY - Preferred Component: The nanoparticles are nanotubes, nanofibers, nanohorns, nanopowders, nanospheres, or quantum dots. The nanoparticles are carbon nanotubes. The carbon fibers comprise a porous electrode and carbon paper. The carbon nanotubes are seeded with one or more catalysts from Co1-xMox (1); Co1-x-yNixMoy (2); Co1-x-yzNixVyCrz (3); Ni1-x-yMoxAly (4); or Co1-x-yNixAly (5). The carbon nanotubes are seeded with Co8.8M-1.2, Co2.2Ni5.6Mo2.2, Co5.7Ni2.1V1.1Cr1.1, Ni8MolAl1, or Co6.4Ni2.4Al1.2. The nanoparticles are attached, or incorporated into, a porous carbon **substrate**, porous electrically **conducting substrate**, or **polymer**

substrate. The nanoparticles are electrically coupled to an electrode. The first fuel cell catalyst and the second fuel cell catalyst are the same materials. The proton exchange membrane comprises Nafion, silicon oxide Nafion composite, polyphosphazenes (PPO), sulfonated PPO, or silica-polymer composites. The first conductive layer and first fuel cell catalyst further include a microdiffusion layer between the electrode and the catalyst. The first conductive electrode and the first fuel cell catalyst form an integral single layer. The first fuel cell catalyst and the second fuel cell catalyst each additionally acts as a microdiffusion layer. The second conductive electrode and the second fuel cell catalyst also form an integral single layer.

x (for (1))=0-0.3;
 x (f(2))=0.1-0.7;
 y (for (2))=0-0.3;
 x (for (3) and (5))=0-0.7;

y,z (for (3) and (5))=0-0.2;

x,y (for (4))=0-0.2.

Preferred Parameter: The nanoparticles are nanotubes having a length of less than 50 microns, a width less than 100 nm, and a diameter of 50-100 nm. The proton exchange membrane has a thickness of 2-100 microns.

Preferred Method: The depositing is sputtering deposition, chemical vapor deposition (CVD), molecular beam epitaxy (MBE), plasma-assisted vapor deposition, or electron beam evaporation deposition.

EXTENSION ABSTRACT:

EXAMPLE - The carbon nanotubes deposited on the carbon fiber papers were used for enhancing the catalyst surface area and providing a micro gas-diffusion structure. The growth procedures for carbon nanotubes on carbon fiber of carbon paper were depositing 200Angstrom thick Ni on carbon fiber paper as catalysts; putting carbon fiber paper into tube-furnace; flowing argon (Ar) in 100 ml/minute rate to push air away for 30 minutes; flowing a mixture of Ar (50 ml/minute) and hydrogen (H₂, 10 ml/minute) into tube furnace and starting rising temperature to 700degreesC in 20degreesC/minute; at 700degreesC, changing a mixture of gas flow to Ar (15 ml/minute), H₂ (15 ml/minute) and ethylene (50 ml/minute) into tube for 10 minutes; and cooling down temperature to 20degreesC at 20degreesC/minute. Nanotubes were ground in a miller with ethanol. The produced suspension was smeared or sprayed on the carbon paper. Pt was ion-beam deposited on the top surface of the smeared nanotubes. The measured catalytic effectiveness reached the level of that on grown nanotubes. Fuel cells were prepared by dropping nafion solution (5 mol%) on the catalyst coated carbon paper or carbon nanotubes/ carbon paper and drying it in air; cutting a piece of carbon electrode covered with Pt/ruthenium, carbon ink as catalyst; putting the standard electrode, membrane and the catalyst sample as a sandwich structure on the hot pressing machine; and pressing them in 1 ton pressure at 80degreesC for 10 minutes to form a fuel cell membrane assembly.

FILE SEGMENT: CPI; GMPI; EPI
MANUAL CODE: CPI: A12-E06B; L02-F05C; L03-E04B
EPI: X16-C01C; X16-E06A1

L105 ANSWER 8 OF 19 WPIX COPYRIGHT 2006 THE THOMSON CORP on STN
ACCESSION NUMBER: 2005-211592 [22] WPIX
DOC. NO. CPI: C2005-067784 [22]
DOC. NO. NON-CPI: N2005-174890 [22]
TITLE: Composition useful for protecting a
negative electrode for a
lithium metal battery
comprises a multifunctional monomer, plasticizer
and an alkali **metal** salt
DERWENT CLASS: A18; A28; A85; E19; L03; X16
INVENTOR: CHO C; CHO C K; HWANG D; HWANG S; HWANG S S; KO T;
LEE S; LEE S M; CHO J G; HWANG D C
PATENT ASSIGNEE: (CHOC-I) CHO C; (HWAN-I) HWANG D; (HWAN-I) HWANG S;
(LEES-I) LEE S; (SMSU-C) SAMSUNG DENKAN KK;
(SMSU-C) SAMSUNG SDI CO LTD
COUNTRY COUNT: 4

PATENT INFORMATION:

| PATENT NO | KIND | DATE | WEEK | LA | PG | MAIN IPC |
|-----------|---------|---------|--------------|----|----|----------|
| MEI HUANG | EIC1700 | REM4B28 | 571-272-3952 | | | |

06/12/2006

| | | | | | |
|----------------|----|--------------------|----|-------|------------|
| US 20050042515 | A1 | 20050224 (200522)* | EN | 12[5] | |
| JP 2005071998 | A | 20050317 (200522) | JA | 19 | H01M004-02 |
| KR 2005023123 | A | 20050309 (200552) | KO | | H01M004-02 |
| CN 1645648 | A | 20050727 (200577) | ZH | | H01M004-02 |
| KR 497251 | B | 20050623 (200659) | KO | | H01M004-02 |

APPLICATION DETAILS:

| PATENT NO | KIND | APPLICATION | DATE |
|----------------|------|------------------|----------|
| US 20050042515 | A1 | US 2004-923126 | 20040819 |
| KR 2005023123 | A | KR 2003-57689 | 20030820 |
| JP 2005071998 | A | JP 2004-239903 | 20040819 |
| CN 1645648 | A | CN 2004-10095981 | 20040820 |
| KR 497251 | B | KR 2003-57689 | 20030820 |

FILING DETAILS:

| PATENT NO | KIND | PATENT NO |
|-----------|-----------------|-----------------|
| KR 497251 | B Previous Publ | KR 2005023123 A |

PRIORITY APPLN. INFO: KR 2003-57689 20030820

INT. PATENT CLASSIF.:

MAIN: H01M004-02
 SECONDARY: H01M010-40; H01M004-04; H01M004-38; H01M004-58;
 H01M004-60

IPC RECLASSIF.: H01M0010-36 [I,C]; H01M0010-38 [I,A]; H01M0010-40
 [I,A]; H01M0004-02 [I,A]; H01M0004-02 [I,C];
 H01M0004-04 [I,A]; H01M0004-04 [I,C]; H01M0004-36
 [I,C]; H01M0004-38 [I,A]; H01M0004-38 [I,C];
 H01M0004-48 [I,A]; H01M0004-48 [I,C]; H01M0004-58
 [I,A]; H01M0004-58 [I,C]; H01M0004-60 [I,A];
 H01M0004-62 [I,A]; H01M0004-62 [I,C]

BASIC ABSTRACT:

US 20050042515 A1 UPAB: 20060203

NOVELTY - A composition comprises a multifunctional monomer having at least two double bonds for facilitating cross-linking, a plasticizer having an ether group and at least one alkali metal salt.

DETAILED DESCRIPTION - An INDEPENDENT CLAIM is included for a lithium metal battery comprising a positive electrode having a positive active material, a negative electrode having a negative active material selected from lithium metal or an alloy of lithium metal, where the negative electrode has a protective layer formed by curing the composition.

USE - For protecting a negative electrode for a lithium metal battery (claimed).

ADVANTAGE - The composition protects negative electrode for a lithium metal battery, which can provide good battery cycle life characteristics.

TECHNOLOGY FOCUS:

ORGANIC CHEMISTRY - Preferred Composition: The composition comprises (pbw) multifunctional monomer (5 - 50, 10 - 35), plasticizer (5 - 70, preferably 20 - 50) and further a reactive monomer (5 - 90, preferably 15 - 50) having an alkylene oxide group

and a reactive double bond, and 0.1 - 1 pbw of a photoinitiator or a thermal initiator.

Preferred Components: The multifunctional group has a number average molecular weight of 170 - 4000 and is selected from an allyl group-included compound, an acrylate-based compound and acryloyl-based compound. The allyl group-included compound is selected from diallyl maleate, diallyl sebacate, diallyl phthalate, triallyl cyanurate, triallyl isocyanurate, triallyl trimellitate, and triallyl trimesate. The acrylate-based compound is ethylene glycol di(meth)acrylate (EGD(M)A), diethylene glycol di(meth)acrylate ((DEGD(M)A), triethylene glycol di(meth)acrylate (TriEGD(M)A), tetraethylene glycol di(meth)acrylate (TetEGD(M)A), tripropylene glycol di(meth)acrylate (TriPGD(M)A), tetrapropylene glycol di(meth)acrylate (TetPGD(M)A), nonapropylene glycol di(meth)acrylate (NPGD(M)A), 1,3-butylene glycol di(meth)acrylate, 1,4-butanediol di(meth)acrylate, 1,5-pentadiol di(meth)acrylate, neopentyl glycol di(meth)acrylate, diacrylate of caprolactone-modified neopentyl glycol hydroxypivalate ester, 1,6-hexanediol di(meth)acrylate, 1,6-hexanediol ethoxylate di(meth)acrylate, 1,6-hexanediol propylate di(meth)acrylate, trimethylolpropane tri(meth)acrylate, trimethylolpropane ethoxylate tri(meth)acrylate, trimethylolpropane benzoate di(meth)acrylate, propylene oxide-modified trimethylol propane tri(meth)acrylate, di(trimethylolpropane) tetra(meth)acrylate, pentaerythritol tri(meth)acrylate, pentaerythritol tetra(meth)acrylate, pentaerythritol propylate tri(meth)acrylate, dipentaerythritol penta-/hexa(meth)acrylate, alkyloyl-partially-modified dipentaerythritol acrylate, hexa(meth)acrylate of dipentaerythritol-partially-modified caprolactone, bisphenol A di(meth)acrylate, bisphenol A ethoxylate di(meth)acrylate, diacrylate of bisphenol F partially-modified ethylene oxide, 3-hydroxy-2,2-dimethylpropyl-3-hydroxy-2,2-dimethylpropionate di(meth)acrylate, 1,14-tetradecanediol di(meth)acrylate, tricycle(5.2.1.0(2,6))decanedimethanol di(meth)acrylate, and S,S'-thiodi-4,1-phenylene bis(thiomethacrylate). The acryloyl-based compound is dicarboxy-terminated, glycidyl methacrylate diester, bis(2-(methacryloyloxy)ethyl phosphate, trimethacryloyloxyethyl phosphate, bismethacryloyloxyethyl hydroxyethyl isocyanurate, tri(2-acryloyloxy)ethyl isocyanurate, trimethacryloyloxyethyl isocyanurate, hydroxypivalyl hydroxypivalate bis(6-(acryloyloxy)hexanoate-) and 1,3,5-triacryloylhexahydroxy-1,3,5-triazine.

The reactive monomer is of formula $\text{CH}_2=\text{C}(\text{R}_1)-\text{C}(\text{O})\text{O}-(\text{CH}_2-\text{CH}_2-\text{O})_x-(\text{CH}_2-\text{CHR}_2-\text{O})_y-\text{R}_3$ (preferably ethylene glycol methyl ether (meth)acrylate (EGME(M)A), ethylene glycol phenylether (meth)acrylate (EGPE(M)A), ethylene glycol phenylether (meth)acrylate (EGPE(M)A), diethylene glycol methyl ether (meth)acrylate (DEGME(M)A), diethylene glycol 2-ethylhexylether (meth)acrylate (DEGEHE(M)A), ethylene glycol dicyclophenylether (meth)acrylate (EGDCPE(M)A) or dipropylene glycol allylether (meth)acrylate).

$\text{R}_1, \text{R}_2 = \text{H}$ or 1-6C alkyl;

$\text{R}_3 = \text{H}$, 1-12C alkyl or 6-36C aryl;

$x, y = \text{at least } 0$ or at least 1.

provided that when x is at least 1, then y is 0 and when x is at least 0, then y is 1 or more.

The reactive monomer has a number average molecular weight of 130 - 1100. The plasticizer is 4-30C alkylene glycol dialkyl ether or 3-4C cyclic ether. The photoinitiator is benzoin, benzoinethylether, benzoinisobutylether, alpha-

methylbenzoinethylether, benzoin phenylether, acetophenone, dimethoxyphenylacetophenone, 2,2-diethoxyacetophenone, 1,1-dichloroacetophenone, trichloroacetophenone, benzophenone, para-chlorobenzophenone, 2,4-dihydroxybenzophenone, 2-hydroxy-4-methoxybenzophenone, 2-hydroxy-2-methyl propionphenone, benzyl benzoate, benzoyl benzoate, anthraquinone, 2-ethylanthraquinone, 2-chloroanthraquinone, 2-methyl-1-(4-methylthiophenyl)-morpholynopropaneone-1, 2-hydroxy-2-methyl-1-phenylpropane-1-one, 2-benzyl-2-dimethylamino-1-(4-morpholynophenyl)-butanone-1, 1-hydroxycyclohexylphenylketone, benzyldimethylketal, thioxanthone, isopropyl thioxanthone, chlorothioxanthone, benzyl disulfide, butanedione, carbazole, fluorenone or alpha-acyloxime ester.

The thermal initiator is benzoyl peroxide, acetyl peroxide, dilauryl peroxide, di-tert-butyl peroxide, cumyl hydro-peroxide, azobisbutyronitrile or azobisisovaleronitrile.

POLYMERS - Preferred Components: The allyl group-included compound is **polyethylene** glycol di(meth) acrylate (PEGD(M)A) or **polypropylene** glycol di(meth)acrylate (PPGD(M)A). The acryloyl-based compound is poly(acrylonitrile-co-butadiene-co-acrylic acid). The reactive monomer is **polyethylene** glycol methyl ether (meth)acrylate (PEGME(M)A), **polyethylene** glycol ethylether (meth)acrylate (PEGEE(M)A), **polyethylene** glycol 4-nonylphenylether (meth) acrylate (PEGNPE(M)A), **polyethylene** glycol phenylether (meth)acrylate (PEGPE(M)A), **polypropylene** glycol methylether (meth)acrylate (PPGME(M)A) or **polypropylene** glycol 4-nonylphenylether(meth) acrylate. The plasticizer is, **polyethylene** glycol dimethylether. The protective layer further comprises the reactive monomer and has a thickness of 0.1 - 50 (preferably 0.3 - 30) mum.

INORGANIC CHEMISTRY - Preferred Components: The alkali metal salt is of formula (AB). The **negative electrode** further comprises an inorganic protective layer selected from an inorganic single layer and an inorganic double layer (preferably LiPON, Li₂CO₃, Li₃N, Li₃PO₄ or Li₅PO₄, or lithium nitride, lithium carbonate, lithium silicate, lithium borate, lithium aluminate, lithium phosphate, lithium phosphorous oxynitride, lithium silicosulfide, lithium germanosulfide, lithium lanthanum oxide, lithium titanium oxide, lithium borosulfide, lithium aluminosulfide and/or lithium phosphosulfide). The inorganic protective layer has a thickness of 10 - 10000Angstrom. The positive active material is selected from elemental sulfur (S₈), Li₂Sn, Li₂Sn dissolved in catholyte, an organic sulfur compound, and a carbon-sulfur polymer ((C₂S_x1)_n) (preferably lithium transition metal oxide).

A = cation of an alkali metal selected from lithium, sodium, and potassium;

B = anion;

n = 1 or more;

x1 = 2.5-50;

n1 = 2 or more.

Preferred Composition: The concentration of the alkali metal salt in the composition is 3 - 20 (preferably 5 - 20) pbw.

EXTENSION ABSTRACT:

SPECIFIC COMPOUNDS - Dimethoxy ethane, bis(2-methoxyethylether), triethylene glycol dimethylether, tetraethylene glycol dimethylether, propylene glycol dimethylether and dioxolane are specifically claimed as the plasticizers. LiClO₄, LiBF₄, LiPF₆,

LiAsF₆, LiAlCl₄, LiSbF₆, LiSCN, LiCF₃SO₃, LiN(CF₃SO₂)₂, LiN(C₂F₅SO₂)₂, LiC₄F₉SO₃, LiCF₃CO₂, LiN(CF₃CO₂)₃, NaClO₄, NaBF₄, NaSCN and KBF₄ are specifically claimed as the alkali metal salts.

EXAMPLE - Diethylene glycol diacrylate (multifunctional monomer) (5.4 g), **polyethylene** glycol methylether methacrylate (molecular weight 300) (reactive monomer) (5.4 g), **polyethylene** glycol dimethyl ether (molecular weight 250) (plasticizer) (9.2 g), LiN(CF₃SO₂)₂ lithium salt (5.76 g) and benzoinethyl ether (photo initiator) (0.048 g) were mixed to completely dissolve the lithium salt and the photo initiator, to obtain a composition for protecting a **negative electrode**. Using the composition, a cross-linked protective layer was produced by coating on a glass **substrate** with a predetermined thickness. A spacer for controlling thickness was then settled on each end of the **substrate** and another glass **substrate** was covered, in order to obtain a film with a uniform thickness. Then the **substrate** was irradiated with ultraviolet light (365 nm wavelength) for 2 minutes, which cured and hardened the coating, yielding a transparent protective layer (20 μm). - A comparative composition for protecting **negative electrode** was prepared by mixing (g) **polyethylene** glycol methylether methacrylate (molecular weight 330) (reactive monomer) (10), **polyethylene** glycol dimethylether (molecular weight 250) (plasticizer) (10), LiCF₃SO₃ lithium salt (2) and benzoinethylether (photo initiator) (0.047) to completely dissolve them. The test composition had a measured ionic conductivity of 4.7x10⁻⁶ S/cm. The obtained protective layer was transparent and exhibited good adhesion, ductility, and mechanical strength. While for the comparative composition, an attempt was made to cure the composition, but the composition did not harden, and a protective layer could not be formed.

FILE SEGMENT: CPI; EPI
MANUAL CODE: CPI: A12-E06A; E05-A01; E05-A02; E07-A03C;
E10-A09B8; E10-A14B; E10-A24B; E10-H01D; E31-C;
E31-L; E31-M; E31-Q06; E33-F; E33-G; L03-E01B5B
EPI: X16-B01F1; X16-E09

L105 ANSWER 9 OF 19 WPIX COPYRIGHT 2006 THE THOMSON CORP on STN
ACCESSION NUMBER: 2004-747193 [73] WPIX
DOC. NO. CPI: C2004-262462 [73]
DOC. NO. NON-CPI: N2004-590307 [73]
TITLE: **Negative electrode for lithium battery, e.g. lithium-sulfur battery, comprises protective layer formed on lithium metal and comprising high ion conductivity material**
DERWENT CLASS: L03; P42; X16
INVENTOR: CHO C; CHO C K; CHO J G; LEE J; LEE J G; LEE J K;
LEE J W; LEE S; LEE S M
PATENT ASSIGNEE: (SMSU-C) SAMSUNG DENKAN KK; (SMSU-C) SAMSUNG SDI CO LTD
COUNTRY COUNT: 4

PATENT INFORMATION:

| PATENT NO | KIND | DATE | WEEK | LA | PG | MAIN IPC |
|----------------|------|----------|-----------|----|----|----------|
| US 20040209159 | A1 | 20041021 | (200473)* | EN | 8 | [3] |

| | | | | |
|---------------|---|-------------------|-------|------------|
| JP 2004319489 | A | 20041111 (200474) | JA 11 | H01M004-02 |
| KR 2004090561 | A | 20041026 (200516) | KO | H01M004-02 |
| CN 1571187 | A | 20050126 (200530) | ZH | H01M004-02 |
| KR 508945 | B | 20050817 (200662) | KO | H01M004-02 |

APPLICATION DETAILS:

| PATENT NO | KIND | APPLICATION | DATE |
|-------------------|------|------------------|----------|
| US 20040209159 A1 | | US 2004-820762 | 20040409 |
| KR 2004090561 A | | KR 2003-24427 | 20030417 |
| JP 2004319489 A | | JP 2004-116658 | 20040412 |
| CN 1571187 A | | CN 2004-10071491 | 20040417 |
| KR 508945 B | | KR 2003-24427 | 20030417 |

FILING DETAILS:

| PATENT NO | KIND | PATENT NO |
|-----------|-----------------|-----------------|
| KR 508945 | B Previous Publ | KR 2004090561 A |

PRIORITY APPLN. INFO: KR 2003-24427 20030417

INT. PATENT CLASSIF.:

MAIN: H01M004-02

SECONDARY: H01M010-40; H01M004-04; H01M004-38; H01M004-66

IPC RECLASSIF.: B05D0005-12 [I,A]; B05D0005-12 [I,C]; H01M0010-36 [I,C]; H01M0010-40 [I,A]; H01M0002-16 [I,A]; H01M0002-16 [I,C]; H01M0004-02 [I,A]; H01M0004-02 [I,C]; H01M0004-04 [I,A]; H01M0004-04 [I,C]; H01M0004-38 [I,A]; H01M0004-38 [I,C]; H01M0004-40 [I,A]; H01M0004-40 [I,C]; H01M0004-62 [I,A]; H01M0004-62 [I,C]; H01M0004-66 [I,A]; H01M0004-66 [I,C]

BASIC ABSTRACT:

US 20040209159 A1 UPAB: 20060122

NOVELTY - A **negative electrode** of a **lithium battery** comprises a **lithium metal** and a protective layer formed on the **lithium metal**. The protective layer comprises a material having an ion conductivity of greater than or equal to 5×10^{-5} S/cm.

DETAILED DESCRIPTION - An INDEPENDENT CLAIM is also included for a method of preparing a **negative electrode** of a **lithium battery** comprising depositing **lithium** on a surface of **lithium metal** under an atmosphere of nitrogen, oxygen, chlorine, carbon monoxide, carbon dioxide, or sulfur dioxide to provide a protective layer comprising a material having an ion conductivity of greater than or equal to 5×10^{-5} S/cm.

USE - For a **lithium battery**, e.g. **lithium-sulfur battery** (claimed), **lithium thin film battery**.

ADVANTAGE - The protective layer includes ion conductive material that has a dense internal structure and an effective adhesive strength to the **lithium metal**. Although the protective layer has a thickness in the order of micrometers, the protective layer does not cause resistance to the electrochemical reaction. The protective layer is chemically stable with respect to both the **lithium metal** and the electrolyte.

DESCRIPTION OF DRAWINGS - The figure shows a schematic view of a deposition device to prepare a protective layer of the

invention.

Lithium (10)

Ion beam (20)

Substrate (30)

Exhaust gas (40)

TECHNOLOGY FOCUS:

ELECTRICAL POWER AND ENERGY - Preferred Components: The protective layer comprises a material having an ion conductivity of greater than or equal to 10^{-3} S/cm. It has a thickness of 500 **Angstrom** - 5 microns. The protective layer has an average surface roughness of less than or equal to 5000 **Angstrom**.

INORGANIC CHEMISTRY - Preferred Materials: The material comprising the protective layer is oxide, nitride, oxynitride, sulfide, oxysulfide, or halonitride. It may be lithium nitride (Li_3N), lithium aluminum chloride (LiAlCl_4), lithium chloronitride ($\text{Li}_9\text{N}_2\text{Cl}_3$), lithium sodium chloronitride ($\text{Li}_9\text{-xNa}_x\text{N}_2\text{Cl}_3$), lithium potassium chloronitride ($\text{Li}_9\text{-xK}_x\text{N}_2\text{Cl}_3$), lithium rubidium chloronitride ($\text{Li}_9\text{-xRb}_x\text{N}_2\text{Cl}_3$), lithium cesium chloronitride ($\text{Li}_9\text{-xCs}_x\text{N}_2\text{Cl}_3$), lithium nitride-lithium iodide ($3\text{Li}_3\text{N-LiI}$), lithium nitride-sodium iodide ($3\text{Li}_3\text{N-NaI}$), lithium nitride-potassium iodide ($3\text{Li}_3\text{N-KI}$), or lithium nitride-rubidium iodide ($3\text{Li}_3\text{N-RbI}$).

x=greater than 0 and less than 9.

The lithium **metal** is a lithium foil, lithium deposited on a resin film base material or a **metal** -deposited resin film base material. Preferred Method: The lithium deposition is carried out by sputtering, ion beam sputtering, electron beam evaporation, vacuum thermal evaporation, laser ablation, chemical vapor deposition, thermal evaporation, plasma chemical vapor deposition, laser chemical vapor deposition, or jet vapor deposition.

ORGANIC CHEMISTRY - Preferred Materials: The material comprising the protective layer is oxide, nitride, oxynitride, sulfide, oxysulfide, or halonitride. It may be lithium nitride (Li_3N), lithium aluminum chloride (LiAlCl_4), lithium chloronitride ($\text{Li}_9\text{N}_2\text{Cl}_3$), lithium sodium chloronitride ($\text{Li}_9\text{-xNa}_x\text{N}_2\text{Cl}_3$), lithium potassium chloronitride ($\text{Li}_9\text{-xK}_x\text{N}_2\text{Cl}_3$), lithium rubidium chloronitride ($\text{Li}_9\text{-xRb}_x\text{N}_2\text{Cl}_3$), lithium cesium chloronitride ($\text{Li}_9\text{-xCs}_x\text{N}_2\text{Cl}_3$), lithium nitride-lithium iodide ($3\text{Li}_3\text{N-LiI}$), lithium nitride-sodium iodide ($3\text{Li}_3\text{N-NaI}$), lithium nitride-potassium iodide ($3\text{Li}_3\text{N-KI}$), or lithium nitride-rubidium iodide ($3\text{Li}_3\text{N-RbI}$).

x=greater than 0 and less than 9.

The lithium **metal** is a lithium foil, lithium deposited on a resin film base material or a **metal** -deposited resin film base material. Preferred Method: The lithium deposition is carried out by sputtering, ion beam sputtering, electron beam evaporation, vacuum thermal evaporation, laser ablation, chemical vapor deposition, thermal evaporation, plasma chemical vapor deposition, laser chemical vapor deposition, or jet vapor deposition.

FILE SEGMENT: CPI; GMPI; EPI
MANUAL CODE: CPI: L03-E01B5B
EPI: X16-E08A; X16-X

L105 ANSWER 10 OF 19 WPIX COPYRIGHT 2006 THE THOMSON CORP on STN
ACCESSION NUMBER: 2004-412581 [39] WPIX
DOC. NO. CPI: C2004-155117 [39]
DOC. NO. NON-CPI: N2004-327326 [39]

TITLE: A process for preparation of Li-polymer
batteries involving a composite system
comprising a conductor, anode, cathode
and separator giving improved cyclic and storage
stability with suppression of disturbing side
reactions

DERWENT CLASS: A18; A25; A85; L03; X16

INVENTOR: KRUGER F; KRUGER F J; NAARMANN H

PATENT ASSIGNEE: (GAIA-N) GAIA AKKUMULATORENWERKE GMBH; (DILO-N)
DILO TRADING AG

COUNTRY COUNT: 104

PATENT INFORMATION:

| PATENT NO | KIND | DATE | WEEK | LA | PG | MAIN IPC |
|---------------|------|----------|-----------|----|-------|------------|
| DE 10251241 | A1 | 20040519 | (200439)* | DE | 10[0] | |
| WO 2004042850 | A2 | 20040521 | (200439) | DE | | |
| AU 2003301777 | A1 | 20040607 | (200469) | EN | | |
| AU 2003301777 | A8 | 20051110 | (200634) | EN | | H01M010-40 |
| DE 10251241 | B4 | 20061102 | (200676) | DE | | |

APPLICATION DETAILS:

| PATENT NO | KIND | APPLICATION | DATE |
|---------------|------|------------------|----------|
| DE 10251241 | A1 | DE 2002-10251241 | 20021104 |
| AU 2003301777 | A1 | AU 2003-301777 | 20031103 |
| AU 2003301777 | A8 | AU 2003-301777 | 20031103 |
| WO 2004042850 | A2 | WO 2003-EP12240 | 20031103 |

FILING DETAILS:

| PATENT NO | KIND | PATENT NO |
|---------------|------|------------------------|
| AU 2003301777 | A1 | Based on WO 2004042850 |
| AU 2003301777 | A8 | Based on WO 2004042850 |

PRIORITY APPLN. INFO: DE 2002-10251241 20021104

INT. PATENT CLASSIF.:

MAIN: H01M010-40

SECONDARY: H01M004-62

IPC ORIGINAL: H01M0010-04 [I,A]; H01M0004-04 [I,A]; H01M0004-48 [I,A]

IPC RECLASSIF.: H01M0010-04 [I,A]; H01M0010-04 [I,C]; H01M0010-36 [I,C]; H01M0010-40 [I,A]; H01M0004-00 [I,A]; H01M0004-00 [I,C]; H01M0004-04 [I,A]; H01M0004-04 [I,C]; H01M0004-48 [I,A]; H01M0004-48 [I,C]; H01M0004-62 [I,A]; H01M0004-62 [I,C]

BASIC ABSTRACT:

DE 10251241 A1 UPAB: 20050530

NOVELTY - A process for preparation of Li-polymer batteries including a composite system involving a conductor, anode and cathode electrode compositions, and a separator, where the conductor film is impacted with electrode composition paste and is combined with a separator so that the electrode substrate side impacted with the paste makes contact with the separator material is new.

USE - The process is useful for production of Li-based batteries.

ADVANTAGE - The process gives Li-polymer **batteries** of smooth structure, devoid of surface **roughness**, improved cyclic and storage stability, with suppression of disturbing side reactions.

TECHNOLOGY FOCUS:

POLYMERS - Preferred Components: The conductor is gauze, fabric, or nonwoven from electrically **conductive polymers** or material and is selected from: metal films, carbon fibers, preferably Cu film for the **anode** and Al film for the cathode, and is 0.1-30 microns, preferably 3-9 microns thick. The conductor, preferably the cathode conductor is provided with an adhesive layer before deposition of the electrode composition. The electrode composition paste for the **anode** mixture includes natural or synthetic intercalatable carbon, aprotic liquids, and conductive salts, where the amount of intercalatable carbon for the **anode** = 50-75 weight%. The cathode paste includes intercalatable (sic) metal oxide, preferably oxides of Co, Ni, Mn, Cr, Mo, W, Ti, aprotic liquids, and conductive salts, where the amount of intercalatable (sic) metal oxide for the cathode = 50-85 weight%. The aprotic liquid is selected from: alkyl carbonates, preferably ethylene-, propylene-, diethyl- or dimethyl carbonate, per fluoroalkyl ether, alkylated ethylene- or propylene glycol or their mixtures, in amount 10-30% of the electrode composition. The conductive salt is LiPF₆, LiClO₄, Li-organoborates, Li-trifluoromethylsulfonyl imides. The amount of conductive salts is 10-15 weight% of the electrode composition, and the salts consist of a solution or dispersion in the aprotic liquid. The electrode compositions contain an organic based thickener, preferably a low molecular ether and/or polyalkylene oxide, polybutadiene oil, polyvinylpyrrolidone, or an inorganic thickener, preferably MgO, C, Al₂O₃ or their mixtures, in amount 0-10, preferably 7.5 weight% of the electrode composition. The separator material is a preprepared porous membrane or a porous membrane obtained by coating or extrusion, comprising preferably a polymer, preferably **polyolefin**, fluoroelastomer, preferably terpolymer based on TFE/PDV/HFP, anionic block copolymer, preferably styrene and diene, preferably alpha-methylstyrene, butadiene and/or isoprene or their mixtures. The amount of polymer is 30-70 weight% of the separator material. The separator material can include aprotic liquid and/or conductive salts. The amount of thickener is 0.5-20 weight% and/or the amount of aprotic liquid is 10-50 weight% on the separator material.

Preferred Process: After coating of the conductor with electrode composition the separator is introduced as an intermediate layer, and lamination is carried out at up to 100 degrees C and 0.1-20 MPa pressure. The process is continuous. The cathode and **anode** are prepared simultaneously at room temperature. The electrode compositions are mixed to give mixed aggregates at 20-80 degrees C, preferably at room temperature. The electrode composition pastes are applied via a wide slit nozzle of width to suit the conductor being coated, in a thickness of 5-100, preferably 20-60 microns.

EXTENSION ABSTRACT:

EXAMPLE - An **anode** composition was prepared from (parts): MSBM 6/28 (RTM, 54), ethyl carbonate (8), polybutadiene (10), dimethyl carbonate (8), Ensaco (RTM; carbon black, 5), and was applied to a Cu film via a wide slit nozzle. A cathode composition was prepared from (parts): Li-Co-Oxid SS5 (RTM; Li-Co oxide, 30), ethylene (9), diethyl carbonate (9), dimethyl carbonate (9), LiOB (3), polybutadiene oil (10), and Ensaco (RTM;

carbon black, 5) and was applied to a primed Al film.

FILE SEGMENT: CPI; EPI
MANUAL CODE: CPI: A12-E06A; A12-E06B; A12-W12; L03-E01B5
EPI: X16-A02A; X16-B01F1; X16-E08A

L105 ANSWER 11 OF 19 WPIX COPYRIGHT 2006 THE THOMSON CORP on STN
ACCESSION NUMBER: 2004-388212 [36] WPIX
DOC. NO. CPI: C2004-145299 [36]
DOC. NO. NON-CPI: N2004-309071 [36]
TITLE: **Negative electrode for lithium secondary battery used in portable electronic instruments, includes substrate, and lithium layer coated on substrate**
DERWENT CLASS: A85; L03; X16
INVENTOR: CHO C; CHO C K; CHO J G; LEE J; LEE J W
PATENT ASSIGNEE: (SMSU-C) SAMSUNG DENKAN KK; (SMSU-C) SAMSUNG SDI CO LTD
COUNTRY COUNT: 35

PATENT INFORMATION:

| PATENT NO | KIND | DATE | WEEK | LA | PG | MAIN IPC |
|----------------|------|----------|-----------|----|--------|------------|
| US 20040081889 | A1 | 20040429 | (200436)* | EN | 10 [4] | |
| EP 1416573 | A2 | 20040506 | (200436) | EN | | |
| JP 2004146348 | A | 20040520 | (200436) | JA | 12 | H01M004-66 |
| CN 1492529 | A | 20040428 | (200446) | ZH | | H01M004-64 |
| KR 2004036438 | A | 20040430 | (200456) | KO | | H01M004-36 |
| KR 485091 | B | 20050422 | (200655) | KO | | H01M004-36 |

APPLICATION DETAILS:

| PATENT NO | KIND | APPLICATION | DATE |
|----------------|------|----------------|----------|
| US 20040081889 | A1 | US 2003-603777 | 20030626 |
| KR 2004036438 | A | KR 2002-65483 | 20021025 |
| JP 2004146348 | A | JP 2003-164281 | 20030609 |
| EP 1416573 | A2 | EP 2003-90199 | 20030704 |
| CN 1492529 | A | CN 2003-145389 | 20030707 |
| KR 485091 | B | KR 2002-65483 | 20021025 |

FILING DETAILS:

| PATENT NO | KIND | PATENT NO |
|-----------|-----------------|-----------------|
| KR 485091 | B Previous Publ | KR 2004036438 A |

PRIORITY APPLN. INFO: KR 2002-65483 20021025

INT. PATENT CLASSIF.:

MAIN: H01M004-36; H01M004-66
SECONDARY: H01M010-36; H01M010-40; H01M002-16; H01M004-02;
H01M004-04; H01M004-58; H01M004-60; H01M004-64
IPC RECLASSIF.: H01M0010-36 [I,A]; H01M0010-36 [I,C]; H01M0010-40
[I,A]; H01M0002-16 [I,A]; H01M0002-16 [I,C];
H01M0004-02 [I,A]; H01M0004-02 [I,C]; H01M0004-04
[I,A]; H01M0004-04 [I,C]; H01M0004-36 [I,C];
H01M0004-48 [I,A]; H01M0004-48 [I,C]; H01M0004-58
[I,A]; H01M0004-58 [I,C]; H01M0004-60 [I,A];
H01M0004-64 [I,A]; H01M0004-64 [I,C]; H01M0004-66

[I,A]; H01M0004-66 [I,C]

BASIC ABSTRACT:

US 20040081889 A1 UPAB: 20050529

NOVELTY - A **negative electrode** (10) for a **lithium secondary battery**, comprises a **substrate** (20) having a mean **roughness** of 30-4000Angstrom; and a **lithium layer** (30) coated on the **substrate**.

DETAILED DESCRIPTION - An **INDEPENDENT CLAIM** is also included for a **lithium secondary battery** comprising a **negative electrode** of the invention; and a **positive electrode** comprising **positive active material(s)** from **lithium-included metal oxide**, a **lithium-included chalcogenide compound**, a **sulfur-based material**, or a **conductive polymer**.

USE - For a **lithium secondary battery** (claimed) used in portable electronic instruments.

ADVANTAGE - The inventive **negative electrode** can provide a **lithium secondary battery** with improved cycle-life characteristics.

DESCRIPTION OF DRAWINGS - The figure is a cross-sectional drawing of a **negative electrode** of the invention.

Negative electrode (10)

Substrate (20)

Lithium layer (30)

TECHNOLOGY FOCUS:

ELECTRICAL POWER AND ENERGY - Preferred Component: A separator is interposed between the positive and **negative electrodes**. An electrolyte is also included which is non-aqueous or solid electrolyte. Preferred Material: The **substrate** for the **negative electrode** comprises a **conductive material**. Preferred Property: The mean **roughness** of the **substrate** is 30-3000, preferably 30-100Angstrom.

POLYMERS - Preferred Material: The **substrate** is a **metal foil**, a **metal film**, a **conductive polymer film**, a **polymer film deposited with metal**, or a **polymer film incorporated with a conductive agent**. The **conductive polymer film** is **polyacetylene**, **polypyrrole**, **polyaniline**, **polythiophene**, **poly(p-phenylene)**, **poly(phenylene vinylene)**, **polyazulene**, **polyperinaphthalene**, **polyacene**, or **polynaphthalene-2,6-diyl**. The **polymer film deposited with metal** is a **polymer film from polyester**, **polyolefin**, **polyamide**, **poly(vinylidene fluoride)**, **poly(tetrafluoroethylene)**, **polystyrene**, **poly(acrylonitrile)**, **poly(vinyl chloride)**, **polycarbonate**, **polyacrylate**, and/or their copolymers. The **polymer film incorporated with the conductive agent** is a **polymer film from polyester**, **polyolefin**, **polyamide**, **poly(vinylidene fluoride)**, **poly(tetrafluoroethylene)**, **polystyrene**, **poly(acrylonitrile)**, **poly(vinyl chloride)**, **polycarbonate**, **polyacrylate**, and/or their copolymers. The **polyester** is **poly(ethylene terephthalate)**, **poly(butylene terephthalate)**, and/or their copolymers. The **polyolefin** is **polyethylene**, **polypropylene**, and/or their copolymers. The **polyamide** is **nylon** and/or their copolymers. The **polyacrylate** is **poly(methyl methacrylate)** and/or their copolymers. The separator is made of a **polyethylene**, **polypropylene**, or

polyvinylidene fluoride separator, a polyethylene/polypropylene two-layered separator, a polyethylene/polypropylene/polyethylene three-layered separator, or a polypropylene/polyethylene/polypropylene three-layered separator. Preferred Property: The mean roughness of polymer film deposited with metal is 30-3500, preferably 30-100Angstrom.

INORGANIC CHEMISTRY - Preferred Material: The metal is copper or nickel. The conductive agent is a conductive metal oxide, a metal, or a carbonaceous material. It is also tin oxide, tin phosphate, titanium oxide, a perovskite material, tin, copper, nickel, graphite, or carbon black. The lithium layer is prepared by depositing lithium on the substrate or by compressing a lithium foil. Preferred Component: The lithium-included metal oxide or lithium-included chalcogenide compound is compound(s) of formulae $LixMn1-yMyA2$ (1), $LixMn1-yMyO2-zXz$ (2), $LixMn2O4-zXz$ (3), $LixMn2-yMyA4$ (4), $LixCo1-yMyA2$ (5), $LixCo1-yO2-zXz$ (6), $LixNi1-yMyA2$ (7), $LixNi1-yO2-zXz$ (8), $LixNi1-yCoyO2-zXz$ (9), $LixNi1-y-zCoyMzA$ approximately (10), $LixNi1-y-zCoyMzO2$ approximately (11), $LixNi1-y-zMnyMzA$ approximately (12), or $LixNi1-y-zMnyMzO2$ approximately (13). The sulfur based material comprises elemental sulfur, $Li2Sn$ (nat least1), or $Li2Sn$ (nat least1) dissolved in catholyte, an organo sulfur compound, or a carbon-sulfur polymer $(C2Sx)_n$ (where $x = 2.5-50$, nat least2). (In formulae 1-13)

M = Al, Ni, Co, Mn, Cr, Fe, Mg, Sr, V, or rare earth elements;

A = O, F, S, or P;

X = F, S, or P.

x is at least0.9 but at most1.1, y is at least0 but at most0.5, z is at least0 but at most0.5, alpha is at least0 but at most2.

FILE SEGMENT: CPI; EPI
MANUAL CODE: CPI: A12-E06A; L03-E01B5
EPI: X16-B01F1; X16-E01C

L105 ANSWER 12 OF 19 WPIX COPYRIGHT 2006 THE THOMSON CORP on STN
ACCESSION NUMBER: 2003-898245 [82] WPIX
DOC. NO. CPI: C2003-255202 [82]
DOC. NO. NON-CPI: N2003-716854 [82]
TITLE: Substrate for ion-exchange system
structure useful in electrochemical devices, i.e. fuel cells, comprises surface where at least part is irradiated by laser radiation to enlarge reactive surface area
DERWENT CLASS: L03; P55; S03; X16; X25
INVENTOR: MITTELSTADT L S; SMITH J W
PATENT ASSIGNEE: (HEWP-C) HEWLETT-PACKARD CO; (HEWP-C) HEWLETT-PACKARD DEV CO LP; (MITT-I) MITTELSTADT L S; (SMIT-I) SMITH J W
COUNTRY COUNT: 102

PATENT INFORMATION:

| PATENT NO | KIND DATE | WEEK | LA | PG | MAIN IPC |
|----------------|-----------------------|------|----|-----|------------|
| US 20030170519 | A1 20030911 (200382)* | EN | 13 | [6] | H01M008-10 |
| WO 2003076061 | A2 20030918 (200382) | EN | | | B01J000-00 |
| AU 2003213764 | A1 20030922 (200431) | EN | | | |

| | | | | |
|---------------|----|-------------------|-------|------------|
| EP 1479114 | A2 | 20041124 (200477) | EN | H01M002-00 |
| US 6869712 | B2 | 20050322 (200521) | EN | H01M008-10 |
| JP 2006500734 | W | 20060105 (200603) | JA 13 | |
| AU 2003213764 | A8 | 20051027 (200624) | EN | H01M002-00 |

APPLICATION DETAILS:

| PATENT NO | KIND | APPLICATION | DATE |
|----------------|------|----------------|----------|
| US 20030170519 | A1 | US 2002-91485 | 20020307 |
| AU 2003213764 | A1 | AU 2003-213764 | 20030307 |
| EP 1479114 | A2 | EP 2003-711455 | 20030307 |
| JP 2006500734 | W | JP 2003-574323 | 20030307 |
| WO 2003076061 | A2 | WO 2003-US6960 | 20030307 |
| EP 1479114 | A2 | WO 2003-US6960 | 20030307 |
| JP 2006500734 | W | WO 2003-US6960 | 20030307 |
| AU 2003213764 | A8 | AU 2003-213764 | 20030307 |

FILING DETAILS:

| PATENT NO | KIND | PATENT NO |
|---------------|------|-----------------|
| AU 2003213764 | A1 | WO 2003076061 A |
| EP 1479114 | A2 | WO 2003076061 A |
| JP 2006500734 | W | WO 2003076061 A |
| AU 2003213764 | A8 | WO 2003076061 A |

PRIORITY APPLN. INFO: US 2002-91485 20020307

INT. PATENT CLASSIF.:

MAIN: B01J; H01M002-00; H01M008-10
 SECONDARY: B01J019-08; B23K026-00; H01M002-14; H01M004-92
 IPC ORIGINAL: H01M0004-90 [I,A]; H01M0004-92 [I,A]; H01M0008-02 [I,A]; H01M0008-10 [I,A]

BASIC ABSTRACT:

US 20030170519 A1 UPAB: 20060121
 NOVELTY - A **substrate** for an ion-exchange system structure, comprises a surface (109) where at least a portion is irradiated by a laser radiation to enlarge a reactive surface area.
 DETAILED DESCRIPTION - INDEPENDENT CLAIMS are also included for:

(a) an ion exchange membrane with an enlarged reactive surface, is made by providing a laser **roughened** surface, covering the surface with a solution; allowing the solution to solidify to form an ion exchange membrane; separating the ion exchange membrane from the laser **roughened** surface, where the ion exchange membrane has an enlarged reactive surface that is a negative replica of the laser **roughened** surface;

(b) a fuel cell assembly comprising a n **anode** comprising an ion exchange surface enlarged by laser radiation; a cathode; an electrolyte connecting the **anode** and the cathode; and a fuel;

(c) a method for producing an ion exchange membrane with a **roughened** surface, comprising providing a laser **roughened** surface; covering the laser **roughened** surface with a solution; allowing the solution to solidify to form an ion exchange membrane; and separating the ion exchange membrane from the laser **roughened** surface that is negative replica of the laser **roughened** surface; and

(d) a method for **roughening** a surface of an ion exchange system structure with laser radiation, comprising

providing an ion exchange system structure; providing a source of laser radiation; and irradiating a surface of the ion exchange system structure that increases reactive exchange area of the surface.

USE - For an ion-exchange system structure useful in electrochemical devices, i.e. fuel cells, batteries, sensors, and electrolyzers.

ADVANTAGE - The **substrate** has an enlarged reactive surface area.

DESCRIPTION OF DRAWINGS - The figure shows a schematic illustrating the equipment and process of cone formation on a surface by laser radiation.

Surface (109)

Ablation debris (111)

Cone structure (113)

TECHNOLOGY FOCUS:

INSTRUMENTATION AND TESTING - Preferred Method: The portion is irradiated by exposing the surface to the laser radiation near an ablation threshold of the membrane, or by melting, boiling, or quenching part of the surface with laser radiation. The laser-irradiated surface is coated with a layer of conductive material. The layer of conductive material and the laser-irradiated surface is further coated with a continuous or discontinuous layer of catalytic material. The ion exchange surface is coated by, a layer of conductive material and a layer of catalytic material. The laser radiation is provided through a mask to generate shaded areas on the surface of the ion exchange system structure. The surface of ion exchange system structure is irradiated with laser radiation near an ablation threshold of a material being irradiated.

Preferred Component: The solution comprises an electrolyte and a solvent. The electrolyte is a proton exchange membrane.

Preferred Condition: The laser radiation produces a diffracted image.

INORGANIC CHEMISTRY - Preferred Material: The conductive material is a metal or an alloy. The catalytic material comprises platinum, platinum alloys, vanadium, vanadium alloys, titanium dioxide, iron, nickel, lithium or gold. The catalytic material comprises platinum or platinum alloys.

Preferred Structure: The ion exchange system structure may also be made of silicates.

POLYMERS - Preferred Component: The electrolyte comprises sulfonated ion-conducting aromatic polymer, phosphonated ion-conducting aromatic polymer, carboxylated ion-conduction aromatic polymer, or perfluorinated co-polymer.

Preferred Structure: The ion exchange system structure is made of polymers.

ORGANIC CHEMISTRY - Preferred Solvent: The solvent comprises lower aliphatic alcohols and/or water.

INSTRUMENTATION AND TESTING - Preferred Device: The source of laser radiation is a pulse laser, particularly a neon yttrium aluminum garnet or an excimer laser.

CERAMICS AND GLASS - Preferred Structure: The ion exchange system structure may also be made of ceramics.

FILE SEGMENT: CPI; GMPI; EPI

MANUAL CODE: CPI: L03-E04

EPI: S03-E03; X16-B01; X16-C01C; X16-E06A; X16-F02;
X25-R01B

ACCESSION NUMBER: 2002-239828 [29] WPIX
 DOC. NO. CPI: C2002-072277 [29]
 DOC. NO. NON-CPI: N2002-184998 [29]
 TITLE: Electrochemical cell used as lithium rechargeable batteries or electrochromic devices, includes solid ion conducting layers, and liquid or gel-type ion conducting material
 DERWENT CLASS: L03; P81; S04; U11; U12; U14; X16; X22; X25
 INVENTOR: CHEONG H M; LEE S; LEE S H; TRACY C E
 PATENT ASSIGNEE: (CHEO-I) CHEONG H M; (LEES-I) LEE S; (MIDE-C) MIDWEST RES INST; (TRAC-I) TRACY C E
 COUNTRY COUNT: 93

PATENT INFORMATION:

| PATENT NO | KIND | DATE | WEEK | LA | PG | MAIN IPC |
|----------------|------|----------|-----------|----|--------|------------|
| WO 2001071827 | A2 | 20010927 | (200229)* | EN | 33 [8] | H01M000-00 |
| AU 2001047639 | A | 20011003 | (200229) | EN | | |
| US 20020076616 | A1 | 20020620 | (200244) | EN | | H01M006-14 |
| US 6420071 | B1 | 20020716 | (200248) | EN | | H01M006-14 |
| EP 1273056 | A2 | 20030108 | (200311) | EN | | H01M004-02 |
| AU 2001247639 | A8 | 20050915 | (200569) | EN | | H01M004-02 |

APPLICATION DETAILS:

| PATENT NO | KIND | APPLICATION | DATE |
|----------------|-----------|----------------|----------|
| WO 2001071827 | A2 | WO 2001-US9007 | 20010321 |
| US 20020076616 | A1 Div Ex | US 2000-532168 | 20000321 |
| US 6420071 | B1 | US 2000-532168 | 20000321 |
| AU 2001047639 | A | AU 2001-47639 | 20010321 |
| AU 2001247639 | A8 | AU 2001-247639 | 20010321 |
| EP 1273056 | A2 | EP 2001-920605 | 20010321 |
| EP 1273056 | A2 | WO 2001-US9007 | 20010321 |
| US 20020076616 | A1 | US 2002-60704 | 20020129 |

FILING DETAILS:

| PATENT NO | KIND | PATENT NO |
|---------------|------|-----------------|
| AU 2001047639 | A | WO 2001071827 A |
| EP 1273056 | A2 | WO 2001071827 A |
| AU 2001247639 | A8 | WO 2001071827 A |

PRIORITY APPLN. INFO: US 2000-532168 20000321
 US 2002-60704 20020129

INT. PATENT CLASSIF.:

MAIN: H01M000-00; H01M004-02; H01M006-14
 SECONDARY: G02F001-15; H01M010-40; H01M006-00; H01M006-04;
 H01M006-18

BASIC ABSTRACT:

WO 2001071827 A2 UPAB: 20060119
 NOVELTY - An electrochemical cell comprises: first and second electrodes (18, 22); first and second ion insertion layers (20, 24) disposed on the first and second electrodes; first and second solid ion conducting layers (50, 52) disposed on the first and second ion insertion layers; and a liquid or gel-type ion conducting material disposed between the first and second solid ion conducting layers.

DETAILED DESCRIPTION - INDEPENDENT CLAIMS are also included for the following:

(A) a method of preventing degradation of an ion insertion material having a surface which faces a liquid or **polymer** gel ion **conducting** material; and providing a solid ion conducting layer between the surface of the ion insertion material and the liquid **polymer** gel ion **conducting** material; and

(B) a method of producing a durable electrochemical cell comprising:

(a) preparing first electrode-equipped section (42) by: (i) depositing a first ion insertion material on a first conducting material; and

(ii) depositing a first solid ion conducting material on the first ion insertion material;

(b) preparing a second electrode-equipped section (44) by:

(i) depositing a second ion insertion material on a second conducting material; and depositing a second solid ion conducting material on the second ion insertion material;

(c) disposing the first electrode-equipped section on the second electrode-equipped section, where the first solid ion conducting material is parallel to and spaced apart from the second solid ion conducting material using spacers, the first and second solid ion conducting materials, and spacers define a void; and

(d) inserting a liquid or gel-type ion conducting material into the void.

USE - The cell is used as **lithium** rechargeable **batteries** or electrochromic devices. The **lithium** rechargeable **batteries** are used as power sources for portable electronic equipment in the fields of office automation equipment, household electronic equipment, or communication equipment. The electrochromic devices are used in electrochromic windows or in mirrors of variable reflectance used in automotive rearview mirrors. They are also used in alphanumeric displays for clocks, watches, computer monitors, outdoor advertisement, and announcement boards, and other types of displays.

ADVANTAGE - The cell has increased durability while maintaining its integrity over prolonged life-cycle. The ion insertion materials do not suffer from the degradative effects of being in contact with the liquid or polymer gel electrolyte.

DESCRIPTION OF DRAWINGS - The figure shows a cross-sectional view of a liquid or gel-type electrochemical cell.

First and second electrodes (18, 22)

First and second ion insertion layers (20, 24)

Electrode-equipped section (42, 44)

First and second solid ion conducting layers (50, 52)

TECHNOLOGY FOCUS:

INORGANIC CHEMISTRY - Preferred Components: The first and second solid ion conducting layers are lithium aluminum fluoride or lithium phosphorous oxinitride. The first ion insertion layer can be transition **metal** oxides, transition **metal** (oxy)sulfides, transition **metal** halides, selenides, tellurides, chromates, molybdates, tungstates, vanadates, niobates, tantalates, titanates, or stannates. It is also tungsten oxide. The second ion insertion layer can be vanadium pentoxide (preferably), iridium (IV) oxide, or nickel dioxide.

Preferred Property: The first and second solid electrolyte layers have a thickness of 1000-5000 Angstrom.

ELECTRICAL POWER AND ENERGY - Preferred Component: The first and second electrodes are connected to a voltage source in a

reversible manner, such that polarity of voltage applied across the electrochemical cell. The cell further comprises a first **substrate** disposed on the first electrode on a side opposite that of the first ion layer, and a second **substrate** disposed on the second electrode on a side opposite that of the second ion insertion layer. The first ion insertion layer is cathodic electrochromic material while the second ion insertion layer is an **anodic** electrochromic material.

FILE SEGMENT: CPI; GMPI; EPI
 MANUAL CODE: CPI: L03-E03; L03-G05C
 EPI: S04-B04A; U11-A03C; U12-E01A1; U12-E01A2;
 U12-E02; U14-K02; X16-B01F1; X16-J08; X22-J04;
 X25-U01

L105 ANSWER 14 OF 19 WPIX COPYRIGHT 2006 THE THOMSON CORP on STN
 ACCESSION NUMBER: 2000-686962 [67] WPIX
 DOC. NO. CPI: C2000-208905 [67]
 DOC. NO. NON-CPI: N2000-507959 [67]
 TITLE: Thin-film rechargeable **battery** for
 electronic circuit boards includes cathode film
 with lithium transition metal oxide, electrolyte
 film, **anode** current collector, and
 overlying layer
 L03; X16
 DERWENT CLASS:
 INVENTOR: BATES J B; DUDNEY N J; NEUDECKER B J
 PATENT ASSIGNEE: (LOCK-C) LOCKHEED MARTIN ENERGY RES CORP
 COUNTRY COUNT: 90

PATENT INFORMATION:

| PATENT NO | KIND | DATE | WEEK | LA | PG | MAIN IPC |
|---------------|------|----------|-----------|----|-------|------------|
| WO 2000060689 | A1 | 20001012 | (200067)* | EN | 28[6] | H01M010-36 |
| US 6168884 | B1 | 20010102 | (200103) | EN | | H01M010-00 |
| AU 2000037542 | A | 20001023 | (200107) | EN | | H01M010-36 |

APPLICATION DETAILS:

| PATENT NO | KIND | APPLICATION | DATE |
|---------------|------|----------------|----------|
| WO 2000060689 | A1 | WO 2000-US6997 | 20000317 |
| US 6168884 | B1 | US 1999-285326 | 19990402 |
| AU 2000037542 | A | AU 2000-37542 | 20000317 |

FILING DETAILS:

| PATENT NO | KIND | PATENT NO |
|---------------|----------|---------------|
| AU 2000037542 | A | WO 2000060689 |
| | Based on | A |

PRIORITY APPLN. INFO: US 1999-285326 19990402

INT. PATENT CLASSIF.:

MAIN: H01M010-00; H01M010-36

BASIC ABSTRACT:

WO 2000060689 A1 UPAB: 20060117
 NOVELTY - A thin-film rechargeable **battery**
 comprises a cathode film with a lithium transition metal oxide, an
 electrolyte film that is non-reactive with oxidizing materials and
 metallic lithium, an **anode** current collector, and an

overlying layer. The **battery** is activated during a charge by electrochemical plating of metallic lithium **anode** between the collector and electrolyte film.

DETAILED DESCRIPTION - An INDEPENDENT CLAIM is also included for a method of forming a thin-film **battery** comprising depositing a cathode current collector on a **substrate**, cathode film, an electrolyte film, an **anode** current collector, and an overlying layer; and plating metallic lithium between the **anode** current layer and electrolyte film.

USE - For electronic circuit boards.

ADVANTAGE - The invention has no diminishment of discharge capacity even after many discharge and charge cycles, and no need for special packaging for shipping and handling. It eliminates the high capacity loss during initial charge because the **battery** with an in-situ activation plated **anode** has no **anode** in the as-fabricated state. It also eliminates high air-sensitivity at all times and unsuitability for solder re-flow processing. It exceeds the requirements for the solder re-flow process, showing no signs of degradation in cell performance after being heated at 250degreesC in air for 10 minutes.

DESCRIPTION OF DRAWINGS - The figure shows a schematic view of the **battery**.

- Substrate** (1)
- Cathode current collector (2)
- Cathode film (3)
- Electrolyte film (4)
- Anode** current collector (5)
- Overlying layer (6)
- Metallic lithium **anode** (7)
- Protective coating (8)

TECHNOLOGY FOCUS:

ELECTRICAL POWER AND ENERGY - Preferred Component: The **anode** collector avoids formation of intermetallic compounds with lithium. The overlying layer is non-reactive with lithium. The overlying layer, **anode** collector, and electrolyte film provide reversible stripping of the metallic lithium **anode** (7) during a first discharge of the **battery**, electrochemical plating of plated lithium **anodes** during charges of the **battery**, and reversible stripping of the plated **anodes** during discharges of the **battery**. The plating of each of the **anodes** occurs after a discharge of the **battery**. The overlying layer, **anode** collector, and electrolyte film confine the metallic lithium **anode**. A cathode current collector (2) is coupled to the cathode film and a **substrate** (1) is coupled to the cathode collector. The overlying layer acts as an insulator, provides an impervious barrier to atomic lithium transport, and is responsive to the plating of lithium **anode** to maintain a flat surface. It accommodates volume changes during the reversible stripping and plating. A protective coating (8) coupled to the overlayer is impervious to moisture and non-reactive with the overlayer. Preferred Property: The electrolyte film (4) has a thickness of approximately 1-2um. The overlayer (6) has a thickness of approximately 0.1-3um. The **battery** has less than 5% discharge capacity loss after heating at approximately 250degreesC for approximately 10 minutes prior to the initial charge and at least 50 charge and discharge cycles in a voltage of approximately 4.5-2.5 V. The cathode film (3) has a thickness of approximately 0.01-5um. The **anode** collector (5) has a

thickness of approximately 0.05-2µm and the cathode collector has a thickness of approximately 0.02-1µm. Preferred method: The electrolyte film is deposited by sputtering a lithium phosphate target in a nitrogen-rich atmosphere at approximately 10-200 Angstrom/min. The cathode film and cathode collector coated substrate are heated in a flowing gas atmosphere at 400-900 degrees C.

INORGANIC CHEMISTRY - Preferred Material: The overlayer includes material(s) from lithium phosphorus oxynitride (preferably), aluminum nitride, beryllium oxide, magnesium oxide, calcium oxide, strontium oxide, barium oxide, boron nitride, silicon oxide, silicon nitride, silicon nitrous oxide, scandium oxide, yttrium oxide, lanthanum oxide, thorium oxide, Li₂Be₂O₃, Li₄BeO₃, Li₅AlO₄, Li₄SiO₄, Li₈SiO₆, LiScO₂, LiYO₂, Li₈ZrO₆, LiCeO₂, lithium fluoride, lithium chloride, lithium bromide, lithium iodide, beryllium, zirconium, tantalum, or tungsten. The electrolyte film comprises lithium phosphorus oxynitride. The lithium transition metal oxide comprises lithium and oxygen, and at least one element from the GROUPS IB-VIII B of the periodic table. The **anode** collector includes member(s) from scandium, titanium, vanadium, chromium, manganese, iron, cobalt, nickel, yttrium, zirconium, lanthanum, hafnium, molybdenum, tantalum, tungsten, or titanium nitride. The cathode collector includes a noble metal.

POLYMERS - Preferred Material: The overlayer includes from polytetrafluoroethylene, polyethylene, or parylene.

FILE SEGMENT: CPI; EPI
MANUAL CODE: CPI: L03-E03; L03-H04E
EPI: X16-B01X

L105 ANSWER 15 OF 19 WPIX COPYRIGHT 2006 THE THOMSON CORP on STN
ACCESSION NUMBER: 2000-072273 [06] WPIX
DOC. NO. CPI: C2000-020606 [06]
DOC. NO. NON-CPI: N2000-056559 [06]
TITLE: Fabrication of active metal electrode
used as negative electrodes in
batteries such as lithium
electrodes in lithium- sulfur
batteries
DERWENT CLASS: A85; L03; X16
INVENTOR: TSANG F Y; VISCO S J
PATENT ASSIGNEE: (POLY-N) POLYPLUS BATTERY CO; (POLY-N) POLYPLUS
BATTERY CO INC; (POLY-N) POLYPLUS BATTERY CO LTD
COUNTRY COUNT: 84

PATENT INFORMATION:

| PATENT NO | KIND | DATE | WEEK | LA | PG | MAIN IPC |
|---------------|------|----------|-----------|----|--------|------------|
| WO 9957770 | A1 | 19991111 | (200006)* | EN | 33 [3] | |
| AU 9933713 | A | 19991123 | (200016) | EN | | |
| US 6214061 | B1 | 20010410 | (200122) | EN | | H01M004-04 |
| EP 1093672 | A1 | 20010425 | (200124) | EN | | |
| BR 9910109 | A | 20011009 | (200168) | PT | | |
| KR 2001043145 | A | 20010525 | (200168) | KO | | H01M004-02 |
| MX 2000010743 | A1 | 20010401 | (200171) | ES | | H01M010-40 |
| CN 1307731 | A | 20010808 | (200173) | ZH | | |
| AU 745287 | B | 20020321 | (200233) | EN | | |
| JP 2002513991 | W | 20020514 | (200236) | JA | 40 | H01M004-04 |
| US 6432584 | B1 | 20020813 | (200255) | EN | | H01M004-08 |

| | | | | |
|-------------|----|-------------------|----|------------|
| EP 1093672 | B1 | 20040825 (200456) | EN | |
| DE 69919712 | E | 20040930 (200465) | DE | |
| MX 216784 | B | 20031007 (200467) | ES | H01M010-40 |
| MX 233532 | B | 20060109 (200639) | ES | H01M010-40 |
| CN 1208856 | C | 20050629 (200643) | ZH | H01M004-04 |

APPLICATION DETAILS:

| PATENT NO | KIND | APPLICATION | DATE |
|---------------|----------------|----------------|----------|
| WO 9957770 | A1 | WO 1999-US6895 | 19990329 |
| US 6214061 | B1 Provisional | US 1998-83947P | 19980501 |
| US 6432584 | B1 Provisional | US 1998-83947P | 19980501 |
| US 6214061 | B1 | US 1998-139601 | 19980825 |
| US 6432584 | B1 Cont of | US 1998-139601 | 19980825 |
| AU 9933713 | A | AU 1999-33713 | 19990329 |
| AU 745287 | B | AU 1999-33713 | 19990329 |
| BR 9910109 | A | BR 1999-10109 | 19990329 |
| CN 1307731 | A | CN 1999-808029 | 19990329 |
| DE 69919712 | E | DE 1999-619712 | 19990329 |
| EP 1093672 | A1 | EP 1999-915119 | 19990329 |
| EP 1093672 | B1 | EP 1999-915119 | 19990329 |
| DE 69919712 | E | EP 1999-915119 | 19990329 |
| EP 1093672 | A1 | WO 1999-US6895 | 19990329 |
| BR 9910109 | A | WO 1999-US6895 | 19990329 |
| JP 2002513991 | W | WO 1999-US6895 | 19990329 |
| EP 1093672 | B1 | WO 1999-US6895 | 19990329 |
| DE 69919712 | E | WO 1999-US6895 | 19990329 |
| MX 216784 | B | WO 1999-US6895 | 19990329 |
| MX 233532 | B | WO 1999-US6895 | 19990329 |
| JP 2002513991 | W | JP 2000-547661 | 19990329 |
| US 6432584 | B1 | US 2000-678063 | 20001002 |
| KR 2001043145 | A | KR 2000-712042 | 20001030 |
| MX 2000010743 | A1 | MX 2000-10743 | 20001101 |
| MX 216784 | B | MX 2000-10743 | 20001101 |
| MX 233532 | B | MX 2003-2530 | 20001101 |
| CN 1208856 | C | CN 1999-808029 | 19990329 |

FILING DETAILS:

| PATENT NO | KIND | | PATENT NO | |
|---------------|------|---------------|------------|---|
| AU 745287 | B | Previous Publ | AU 9933713 | A |
| DE 69919712 | E | Based on | EP 1093672 | A |
| AU 9933713 | A | Based on | WO 9957770 | A |
| EP 1093672 | A1 | Based on | WO 9957770 | A |
| BR 9910109 | A | Based on | WO 9957770 | A |
| AU 745287 | B | Based on | WO 9957770 | A |
| JP 2002513991 | W | Based on | WO 9957770 | A |
| EP 1093672 | B1 | Based on | WO 9957770 | A |
| DE 69919712 | E | Based on | WO 9957770 | A |
| MX 216784 | B | Based on | WO 9957770 | A |
| MX 233532 | B | Based on | WO 9957770 | A |

PRIORITY APPLN. INFO: US 1998-139601 19980825
 US 1998-83947P 19980501
 US 2000-678063 20001002

INT. PATENT CLASSIF.:

MAIN: H01M010-40; H01M004-02; H01M004-04; H01M004-08
 SECONDARY: H01M004-40; H01M010-38

IPC RECLASSIF.: H01M0010-36 [I,C]; H01M0010-40 [I,A]; H01M0004-02 [I,A]; H01M0004-02 [I,C]; H01M0004-04 [I,A]; H01M0004-04 [I,C]; H01M0006-18 [N,A]; H01M0006-18 [N,C]

BASIC ABSTRACT:

WO 1999057770 A1 UPAB: 20060115

NOVELTY - A glassy or amorphous protective layer impervious and conductive to active **metal** ions is formed on a **substrate**. A first active **metal** layer is deposited on the protective layer and a current collector (208) is provided on the first active **metal** layer, forming an active **metal** electrode.

DETAILED DESCRIPTION - INDEPENDENT CLAIMS are also included for the following:

(i) a **battery** comprising the active **metal** electrode;

(ii) a partially fabricated **battery** cell essentially consisting of a current collector, a glassy or amorphous protective layer, an active **metal** layer provided between the current collector and the protective layer and a gel or solid electrolyte provided on the protective layer; and

(iii) a **battery** cell comprising the partially fabricated **battery** cell.

USE - Used as lithium electrodes in **lithium-sulfur batteries** (claimed), **negative electrodes** for primary **batteries** such as **lithium manganese dioxide batteries**, **lithium (CF)X batteries**, **lithium thionyl chloride batteries**, **lithium sulfur dioxide batteries**, **lithium iron sulfide batteries** (Li/FeS₂), **lithium polyaniline batteries** and **lithium iodine batteries**, secondary **batteries** such as **lithium-sulfur batteries**, **lithium cobalt oxide batteries**, **lithium nickel oxide batteries**, **lithium manganese oxide batteries** and **lithium vanadium oxide batteries**, other rechargeable **batteries** employing active **metals** other than lithium. Also used as **negative electrodes** and electrode- electrolyte laminates, solid state electrolyte separators such as sodium beta-alumina glass or ceramic, polymeric electrolytes, porous membranes etc.

ADVANTAGE - The protective layer on the **negative electrode** prevents the positive and **negative electrodes** from contacting one another and serves the function of separator. The protective layer is tough, thick and made from a material that resists cracking and abrasion. A high quality protective layer which is smooth, continuous and free of pores or defects is provided on the **substrate**. The protective layer is chemically stable to the electrolyte within the voltage window of the cell and is conductive to lithium ion. The protective layer is impervious to moisture, carbon dioxide, oxygen and the lithium electrode can be handled under ambient conditions without the need of dry box conditions as typically employed to process other lithium electrodes. The protective layer provides a good protection for the lithium and imparts long shelf life of the electrode and electrolyte composites. The **lithium metal** electrode manufactured has a longer cycle life and better safety characteristics. The protective layer formed on the **substrate** prevents formation of dendrites and mossy

deposits. The **batteries** having the active **metal** electrode does not require a carbon intercalation matrix to support **lithium** ions. The **batteries** possess a high energy density than a conventional lithium ion cell. The **lithium metal batteries** do not have a large irreversible capacity loss associated with the formation of **lithium ion batteries**. The **battery** cells obtained using the active electrode is rechargeable.

DESCRIPTION OF DRAWINGS - The figure shows the schematic illustration of a lithium electrode.

partially fabricated lithium electrode (200)
current collector laminate (202)
current collector (208)
electrolyte laminate; (254)
electrolyte layer (256)
glass layer (258)
web carrier (262)

TECHNOLOGY FOCUS:

ELECTRONICS - Preferred Substrate: The **substrate** on which the protective layer is formed is a releasable web carrier (262) such as layer of copper, tin, zinc, aluminum, iron or their combinations or an electrolyte preferably polymeric electrolyte. **Preferred Process:** The protective layer is formed on the **substrate** by a physical deposition process or a chemical vapor deposition process. **Active metal** which is lithium is deposited by evaporation. Another layer of the active **metal** is formed on the current collector, which is then provided on the first active **metal** layer of the protective layer, thereby bonding the second active **metal** layer to the first active **metal** layer. **Preferred Protective Layer:** The protective layer has a thickness of about 50 **Angstrom** to 5 μm preferably 500-2000 **Angstrom** and has a conductivity of 10^{-8} to 10^{-2} (ohm-cm) ⁻¹. The protective layer is conductive to lithium ions, and it includes one or more of a lithium silicate, lithium borate, lithium aluminate, lithium phosphate, lithium phosphorus oxynitride, lithium silicosulfide, lithium borosulfide, lithium aluminosulfide and lithium phosphosulfide. **Preferred Current Collector:** The current collector of the partially fabricated **battery** cell is a **metal** layer or metallized plastic sheet. The **metal** is selected from copper, nickel, stainless steel and zinc. The **battery** comprising the active **metal** electrode is a lithium-sulfur **battery** and the **battery** cell is a lithium-sulfur **battery** cell.

POLYMERS - Preferred Gel: The gel or solid electrolyte is selected from polyethers, polyimines, polythioethers, polyphosphazenes and polymer blends, mixtures and their copolymers, preferably a polyalkylene oxide.

FILE SEGMENT: CPI; EPI
MANUAL CODE: CPI: A12-E06; L03-E01B5
EPI: X16-A02A; X16-B01F1; X16-E03A1; X16-E08A

L105 ANSWER 16 OF 19 WPIX COPYRIGHT 2006 THE THOMSON CORP on STN
ACCESSION NUMBER: 1999-508691 [42] WPIX
DOC. NO. CPI: C1999-148655 [42]
DOC. NO. NON-CPI: N1999-379058 [42]
TITLE: Prismatic electrochemical cell for cellular phones, portable electronic equipment, etc
DERWENT CLASS: A85; X16

INVENTOR: MANK R M
 PATENT ASSIGNEE: (MALO-C) DURACELL INC
 COUNTRY COUNT: 84

PATENT INFORMATION:

| PATENT NO | KIND | DATE | WEEK | LA | PG | MAIN IPC |
|---------------|------|----------|------------|----|--------|------------|
| WO 9941794 | A1 | 19990819 | (199942) * | EN | 25 [6] | H01M004-32 |
| AU 9925982 | A | 19990830 | (200003) | EN | | H01M004-32 |
| EP 1062707 | A1 | 20001227 | (200102) | EN | | H01M004-32 |
| CN 1290407 | A | 20010404 | (200140) | ZH | | H01M004-32 |
| TW 429641 | A | 20010411 | (200157) | ZH | | |
| KR 2001040849 | A | 20010515 | (200167) | KO | | H01M004-32 |
| US 6309775 | B1 | 20011030 | (200172) | EN | | H01M002-00 |
| JP 2002503873 | W | 20020205 | (200212) | JA | 31 | H01M010-30 |
| MX 2000007877 | A1 | 20010601 | (200235) | ES | | H01M010-30 |
| IN 2000000233 | P3 | 20050715 | (200574) | EN | | H01M004-32 |
| CN 1149693 | C | 20040512 | (200617) | ZH | | |

APPLICATION DETAILS:

| PATENT NO | KIND | APPLICATION | DATE |
|---------------|------|----------------|----------|
| WO 9941794 | A1 | WO 1999-US2927 | 19990210 |
| US 6309775 | B1 | US 1998-22561 | 19980212 |
| AU 9925982 | A | AU 1999-25982 | 19990210 |
| CN 1290407 | A | CN 1999-802913 | 19990210 |
| EP 1062707 | A1 | EP 1999-905948 | 19990210 |
| EP 1062707 | A1 | WO 1999-US2927 | 19990210 |
| JP 2002503873 | W | WO 1999-US2927 | 19990210 |
| IN 2000000233 | P3 | WO 1999-US2927 | 19990210 |
| TW 429641 | A | TW 1999-102195 | 19990406 |
| JP 2002503873 | W | JP 2000-531877 | 19990210 |
| IN 2000000233 | P3 | IN 2000-MN233 | 20000727 |
| KR 2001040849 | A | KR 2000-708745 | 20000810 |
| MX 2000007877 | A1 | MX 2000-7877 | 20000811 |
| CN 1149693 | C | CN 1999-802913 | 19990210 |

FILING DETAILS:

| PATENT NO | KIND | PATENT NO |
|---------------|------|--------------|
| AU 9925982 | A | WO 9941794 A |
| EP 1062707 | A1 | WO 9941794 A |
| JP 2002503873 | W | WO 9941794 A |

PRIORITY APPLN. INFO: US 1998-22561 19980212

INT. PATENT CLASSIF.:

MAIN: H01M010-30; H01M002-00; H01M004-32

SECONDARY: H01M004-52

BASIC ABSTRACT:

WO 1999041794 A1 UPAB: 20060201

NOVELTY - The cell comprises a prismatic housing (10) containing a cathode plate (30) in contact with the housing and an anode plate (28) comprising a porous structure in electrical isolation. The maximum linear dimension of the porous structure in the principle direction of ion flow is at least 20% of the maximum linear dimension of the housing cavity.

DETAILED DESCRIPTION - The electrochemical cell comprises a

prismatic housing containing a cathode plate in electrical communication with the housing and an **anode** plate comprising a porous structure electrically isolated from the housing and the cathode. The porous structure is configured so that it defines the direction of ion flow. The maximum linear dimension of porous structure (in the principle direction of ion flow) is 20% or more the maximum linear dimension of the housing cavity (in the principle direction of ion flow).

INDEPENDENT CLAIMS are also included for:

(a) a miniature electrochemical cell with a prismatic housing volume of less than 20 cm³ with outer and inner electrodes disposed inside the housing and the inner electrode having a thickness of at least 1 mm in the principle direction of ion flow;

(b) a nickel electrode plaque for use in a nickel metal hydride cell comprising a porous metallic **substrate** with a metallic hydroxide compound disposed in the pores of the **substrate**. The compound is in the form of a spherical powder and comprises 50% nickel in the form of nickel hydroxide. The plaque has a thickness of 0.5-3 mm and a total volumetric capacity of 560 ampere-hours/liter; and

(c) a metal hydride electrode plaque for use in a nickel metal hydride cell comprising a porous metallic **substrate** having a nickel metal hydride compound disposed in the pores of the **substrate**. The plaque has a thickness of 0.5-3 mm and a total theoretical volumetric capacity of 1000 ampere-hours/liter or more.

USE - For portable electronic equipment (claimed), cellular phones, etc. Nickel or metal hydride electrode plaques for use in nickel metal hydride (NiMH) electrochemical cells are also claimed.

ADVANTAGE - The construction of the electrodes and the cell enables high internal current densities and resulting discharge rates, while achieving very high capacity. The electrochemical cell has a very low percentage of internal volume taken up by inactive materials such as interconnecting tabs and multiple separator layers, leaving a high percentage of internal volume for active material. The construction is simple and provides for efficient, inexpensive manufacture and assembly resulting in minimal scrap and low cost. The cell provides high energy densities for rechargeable applications which do not require extremely high discharge rates. The internally limited maximum discharge rate helps to protect the **battery** against overheating if externally shorted.

DESCRIPTION OF DRAWINGS - The figure is the sectional view of a cell showing one electrode configuration.

Housing; (10)

Can; (12)

Contact button; (18)

Metal tab; (26)

Positive electrode; (28)

Negative electrode; (30)

Separator; (32)

Direction of ion flow (P)

TECHNOLOGY FOCUS:

ELECTRICAL POWER AND ENERGY - Preferred Structure: The maximum linear dimension of the porous structure of the **anode** plate is 52-56 % of the maximum linear dimension of the housing cavity in the principle direction of ion flow. The housing has an overall external dimension of 2-8 mm, preferably 5.6 mm. The porosity of the positive electrode plate is 30-40%, preferably 34-36%. A separator (32) made of non-woven fabric containing **polyolefin** with a thickness of 0.12-0.2 mm is

disposed between the positive and **negative electrodes**. The separator has an average pore size of 6-30 microns. The void volume of the separator is less than 20% the sum of the void volumes of the electrodes and the separator. The **negative electrode** plate is U- shaped having a central portion and two arms extending on opposite sides of the positive electrode plate. The central portion of the **negative electrode** plate is welded to the housing. The ratios of the total capacities of both electrode plates at a C/5 discharge rate to the volume of the housing cavity exceeds about 100 ampere-hours/liter (and preferably exceeds 250 ampere-hours/liter).

Preferred Miniature Cell: The cell is constructed such that to produce a sustained electrical current of 80 milliamperes/cm², where the cross-sectional area of the inner electrode is perpendicular to the principle direction of ion flow, the voltage required is about 1 volt. Preferably, 120 milliamperes/cm² of current is produced. The ratio of the total capacity of the **anode** and cathode to the volume of the housing exceeds 275 ampere-hours/liter.

INORGANIC CHEMISTRY - Preferred Material: The positive electrode contains an active metallic hydroxide compound containing nickel and 0-4 weight % cobalt. Preferably 0.5 weight % of cobalt is contained. Cobalt in the form of cobalt oxide is contained to a weight of 0.03-0.1 times the weight of the metal hydroxide compound. 0-8 weight % zinc (preferably 5 weight % zinc) is present in the active metal hydroxide. Further, the active metal hydroxide compound contains 56-58 weight % nickel. The metal hydroxide compound has an aggregate surface area of 10-30 m²/g (preferably 15 m²/g) and is spheroidal. The compound has a tap density of 1.8-2.2 g/cm³ and has a D101 crystallite plane spacing of less than 100

Angstrom.

FILE SEGMENT: CPI; EPI
MANUAL CODE: CPI: A12-E09
EPI: X16-B01A; X16-E01C1; X16-E05

L105 ANSWER 17 OF 19 WPIX COPYRIGHT 2006 THE THOMSON CORP on STN
ACCESSION NUMBER: 1996-211390 [22] WPIX
DOC. NO. CPI: C1996-067591 [22]
DOC. NO. NON-CPI: N1996-176880 [22]
TITLE: Rechargeable **battery** e.g **lithium**
or zinc type - has porous active
material-retaining body comprising
electroconductive material and insulating or
semiconductor material allowing only ions for
battery reaction to pass
DERWENT CLASS: A85; L03; X16; X21
INVENTOR: ASAO M; KAWAKAMI S; KOBAYASHI N; MISHINA S;
KAWARAMI M; OHAYASHI N; SANBON N
PATENT ASSIGNEE: (CANO-C) CANON KK
COUNTRY COUNT: 12

PATENT INFORMATION:

| PATENT NO | KIND DATE | WEEK | LA | PG | MAIN IPC |
|-------------|-------------|------------|----|--------|------------|
| EP 709907 | A1 19960501 | (199622) * | EN | 34 [4] | H01M004-66 |
| CA 2161076 | A 19960422 | (199634) | EN | | H01H004-02 |
| JP 08171901 | A 19960702 | (199636) | JA | 17 [1] | H01M004-04 |
| CN 1135097 | A 19961106 | (199803) | ZH | | H01M004-02 |

| | | | | | |
|-------------|----|-------------------|----|-------|------------|
| US 5698339 | A | 19971216 (199805) | EN | 24[4] | H01M004-66 |
| EP 709907 | B1 | 19990107 (199906) | EN | | H01M004-66 |
| DE 69507111 | E | 19990218 (199913) | DE | | H01M004-66 |
| ES 2125546 | T3 | 19990301 (199916) | ES | | H01M004-66 |
| CA 2161076 | C | 20000125 (200025) | EN | | H01M004-02 |
| KR 199080 | B1 | 19990615 (200059) | KO | | H01M004-24 |
| CN 1305235 | A | 20010725 (200164) | ZH | | H01M004-02 |
| CN 1079587 | C | 20020220 (200514) | ZH | | H01M004-02 |
| JP 3717085 | B2 | 20051116 (200579) | JA | 28 | H01M004-04 |
| CN 1172385 | C | 20041020 (200615) | ZH | | H01M004-02 |

APPLICATION DETAILS:

| PATENT NO | KIND | APPLICATION | DATE |
|-------------|----------|-----------------|----------|
| EP 709907 | A1 | EP 1995-116586 | 19951020 |
| JP 08171901 | A | JP 1995-260377 | 19951006 |
| JP 3717085 | B2 | JP 1995-260377 | 19951006 |
| CA 2161076 | A | CA 1995-2161076 | 19951020 |
| CA 2161076 | C | CA 1995-2161076 | 19951020 |
| CN 1135097 | A | CN 1995-120509 | 19951020 |
| CN 1305235 | A Div Ex | CN 1995-120509 | 19951020 |
| CN 1079587 | C | CN 1995-120509 | 19951020 |
| DE 69507111 | E | DE 1995-607111 | 19951020 |
| EP 709907 | B1 | EP 1995-116586 | 19951020 |
| DE 69507111 | E | EP 1995-116586 | 19951020 |
| ES 2125546 | T3 | EP 1995-116586 | 19951020 |
| KR 199080 | B1 | KR 1995-36531 | 19951021 |
| US 5698339 | A | US 1995-546937 | 19951023 |
| CN 1305235 | A | CN 2001-104633 | 19951020 |
| CN 1172385 | C | CN 2001-104633 | 19951020 |

FILING DETAILS:

| PATENT NO | KIND | PATENT NO |
|-------------|------|-----------------------------|
| DE 69507111 | E | Based on EP 709907 A |
| ES 2125546 | T3 | Based on EP 709907 A |
| JP 3717085 | B2 | Previous Publ JP 08171901 A |

PRIORITY APPLN. INFO: JP 1995-260377 19951006
JP 1994-256418 19941021

INT. PATENT CLASSIF.:

MAIN: H01H004-02; H01M004-02; H01M004-04; H01M004-24;
H01M004-66

SECONDARY: H01M010-36; H01M010-40; H01M004-62; H01M004-64

BASIC ABSTRACT:

EP 709907 A1 UPAB: 20060131

A rechargeable **battery** has a separator between an **anode** and cathode, with an electrolyte or electrolyte solution in contact with the electrodes. At least the **anode** has an active material-retaining body comprising an electroconductive material and an insulating or semiconductor material able to allow an ion for **battery** reaction to pass through but not able to allow the active material to pass through upon charging. The active material body is at least 10% porous. Also claimed are: (i) the **anode** itself; and (ii) a process for forming the **anode** and the **battery** comprising: (a) applying a compsn. of the electroconductive material, the insulating or semiconductor material and a material capable of forming pores, on

to a **substrate**, and (b) removing the pore-forming material in the applied coat to form the porous **anode** active material-retaining body.

USE - In Li and Zn rechargeable **batteries**, for power supply applications, electric cars, for storing 'dump' power from electricity generation and portable electric devices such as video cameras, etc.

ADVANTAGE - The **anode** is always highly rated and stable, and exhibits excellent **battery** performance while preventing the generation or growth of a dendrite upon repeated charging and discharging, contributing to long cycle life. High electric capacity and high energy density.

DOCUMENTATION ABSTRACT:

EP709907

A rechargeable **battery** has a separator between an **anode** and cathode, with an electrolyte or electrolyte solution in contact with the electrodes.

At least the **anode** has an active material-retaining body comprising an electroconductive material and an insulating or semiconductor material able to allow an ion for **battery** reaction to pass through but not able to allow the active material to pass through upon charging. The active material body is at least 10% porous.

Also claimed are:

(i) the **anode** itself; and
(ii) a process for forming the **anode** and the **battery** by: (a) applying a compsn. of the electroconductive material, the insulating or semiconductor material and a material capable of forming pores, on to a **substrate**, and (b) removing the pore-forming material in the applied coat to form the porous **anode** active material-retaining body.

USE

In Li and Zn rechargeable **batteries**, for power supply applications, electric cars, for storing 'dump' power from electricity generation and portable electric devices such as video cameras, etc.

ADVANTAGE

The **anode** is always highly rated and stable, and exhibits excellent **battery** performance while preventing the generation or growth of a dendrite upon repeated charging and discharging, contributing to long cycle life. The **battery** has high electrical capacity and high energy density.

EXAMPLE

A 50 micron thick Al foil was **roughened** in an aqueous solution containing 5 weight% KOH to form an **anode** collector. A paste was obtd. by mixing powdery Al, powdery fluorocarbon resin paint as insulating material and tetrafluoro lithium borate as pore former at a ratio of 40:10:50 based on their specific gravities, with xylene. The paste was applied on the **roughened** Al foil, and slowly dried to vaporise the xylene, which acts as solvent to elute the pore-former. Further drying was conducted at 170 deg.C. Porosity was 54%.

A cathode was produced by coating an Al foil with a paste comprising lithium manganese oxide, 3 weight% acetylene black and 5 weight% powdery PVdF, in NMP and drying. The **battery** was mfd. in a dry Ar atmos. by inserting the **anode** and cathode separated by a perforated 25 micron thick **polypropylene** separator into a Ti-clad steel can, followed by injecting an electrolyte consisting of a 1M solution of tetrafluoro lithium borate

in a non-aqueous equal mixture of propylene carbonate and dimethoxyethane.

The obtd. **battery** had a prolonged charging and discharging cycle life and excellent energy density, which were greater than those of a **battery** obtd. as above but without the use of a pore-former. (RBH)

PREFERRED BATTERY

The **anode** has an **anode** collector electrically contacting the **anode** active-material-retaining body. The pores are distributed in the active-material-retaining body and have a size distribution peak at 0.15 to 100 nm.

The electroconductive material is covered by the insulating or semiconductor material while having an integral connection, or consists of islands distributed in and integrally connected by the insulating or semiconductor material. The **anode** has cushioning properties so that it is hardly deformed or cracked when repeatedly expanded and shrunk or repeated charging and discharging. The electrically-conductive material is an organic or inorganic high mol. or their composite material, in one or more of a round-flake, chain or sponge-like form, with a specific surface area of 1m²/g. or more.

The insulating or semiconductor material has a molecular structure with gaps greater than the dia. of an ion for **battery** reaction, to allow those ions through but not allowing **anode** active material deposited upon charging to pass through. The insulating or semiconductor material is inert and insol. to the electrolyte and has an element with an electron donating property selected from an unpaired electron, paired electron and a d-electron, or has a group with pi-electron donating property. The insulating or semiconductor material has a large ring or aromatic ring structure, or is a fluorocarbon resin, and can have an ether bond, P=N bond or a carbonyl gp., opt. with a crosslinked molecular structure, or the material can be a glossy metal oxide. The electron donating element is O, N or S.

The electroconductive material is C, graphite, Ni, Al, Cu, Ti, Pt, their alloys or stainless steel.

The **anode** active material is Li or Zn. The cathode has a porosity of 5% or more, the pores having a size distribution peak of 0.2-100 nm., and consists of a cathode active material, electroconductive material and an insulating or semiconductor material. The electroconductive, insulating and semiconductor materials are selected from the same materials as for the **anode**.

PREFERRED PROCESS

The coating formed is subjected to heat or reaction treatment during step (b). The coating is applied by dip. spray, water, screen process printing or roll-coating.

FILE SEGMENT: CPI; EPI
MANUAL CODE: CPI: A08-M09A; A09-A03; A11-B05; A11-C02C; A12-E06;
L03-E03
EPI: X16-B01F1; X16-E01C; X16-E01E; X21-B01

L105 ANSWER 18 OF 19 WPIX COPYRIGHT 2006 THE THOMSON CORP on STN
ACCESSION NUMBER: 1992-260657 [32] WPIX
CROSS REFERENCE: 1992-160576; 1992-218744; 1992-227367; 1995-024224;
1998-469214; 1998-497849; 2003-048214
DOC. NO. CPI: C1992-116390 [32]
DOC. NO. NON-CPI: N1992-199322 [32]
TITLE: Water-and oil-repellent adsorbing film - formed on

glass, ceramic, metal and plastic prods.
by covalently bonding a film containing a fluorocarbon
and siloxane bond to the substrate
surface

DERWENT CLASS: A14; A26; A35; A60; A82; E11; G02; L01; L02; M13;
P42; P73; P81; X12; X22
INVENTOR: MINO N; OGAWA K; SOGA M; SOGA S
PATENT ASSIGNEE: (MATU-C) MATSUSHITA DENKI SANGYO KK; (MATU-C)
MATSUSHITA ELEC IND CO LTD; (MATU-C) MATSUSHITA
ELECTRIC IND CO LTD
COUNTRY COUNT: 5

PATENT INFORMATION:

| PATENT NO | KIND | DATE | WEEK | LA | PG | MAIN IPC |
|---------------|------|----------|-----------|----|--------|------------|
| EP 497189 | A2 | 19920805 | (199232)* | EN | 51[46] | C09D183-08 |
| JP 04249146 | A | 19920904 | (199242) | JA | 6[6] | B32B009-00 |
| JP 04255343 | A | 19920910 | (199243) | JA | 10[19] | B32B007-00 |
| JP 04359031 | A | 19921211 | (199304) | JA | 6[2] | C08J007-04 |
| EP 497189 | A3 | 19921104 | (199342) | EN | | C09D183-08 |
| US 5324566 | A | 19940628 | (199425) | EN | 17[9] | B32B005-00 |
| US 5437894 | A | 19950801 | (199536) | EN | 38[46] | B05D003-06 |
| JP 07086146 | B2 | 19950920 | (199542) | JA | 5[0] | C08J007-04 |
| JP 2500150 | B2 | 19960529 | (199626) | JA | 10[1] | B32B007-02 |
| EP 497189 | B1 | 19970409 | (199719) | EN | 26[9] | C09D183-08 |
| DE 69218811 | E | 19970515 | (199725) | DE | | C09D183-08 |
| JP 2622316 | B2 | 19970618 | (199729) | JA | 8[0] | C08J007-04 |
| JP 10146920 | A | 19980602 | (199832) | JA | 9 | B32B017-10 |
| JP 2809889 | B2 | 19981015 | (199846) | JA | 8 | C08J007-04 |
| JP 10309768 | A | 19981124 | (199906) | JA | 10 | B32B007-02 |
| JP 10310455 | A | 19981124 | (199906) | JA | 9 | C03C017-42 |
| KR 9608915 | B1 | 19960709 | (199921) | KO | | C09D183-04 |
| KR 9702941 | B1 | 19970313 | (199935) | KO | | C09D183-04 |
| CA 2059733 | C | 19991005 | (200007) | EN | | B05D005-08 |
| JP 3017965 | B2 | 20000313 | (200017) | JA | 10 | B32B017-10 |
| JP 2000103007 | A | 20000411 | (200029) | JA | 9 | B32B009-00 |
| JP 3150133 | B2 | 20010326 | (200126) | JA | 9 | B32B009-00 |
| JP 3165672 | B2 | 20010514 | (200129) | JA | 8 | B32B007-02 |
| JP 2001214156 | A | 20010807 | (200150) | JA | 6 | C09K003-18 |
| JP 3444524 | B2 | 20030908 | (200359) | JA | 8 | C03C017-42 |
| JP 2004002187 | A | 20040108 | (200405) | JA | 14 | C03C017-42 |

APPLICATION DETAILS:

| PATENT NO | KIND | APPLICATION | DATE |
|-------------|-----------|----------------|----------|
| EP 497189 | A2 | EP 1992-100938 | 19920121 |
| JP 04249146 | A | JP 1991-36773 | 19910205 |
| JP 07086146 | B2 | JP 1991-36773 | 19910205 |
| JP 10146920 | A Div Ex | JP 1991-36775 | 19910205 |
| JP 2809889 | B2 | JP 1991-36775 | 19910205 |
| JP 10309768 | A Div Ex | JP 1991-36775 | 19910205 |
| JP 10310455 | A Div Ex | JP 1991-36775 | 19910205 |
| JP 3017965 | B2 Div Ex | JP 1991-36775 | 19910205 |
| JP 3165672 | B2 Div Ex | JP 1991-36775 | 19910205 |
| JP 3444524 | B2 Div Ex | JP 1991-36775 | 19910205 |
| JP 04255343 | A | JP 1991-38133 | 19910206 |
| JP 2500150 | B2 | JP 1991-38133 | 19910206 |
| JP 04359031 | A | JP 1991-132737 | 19910604 |

| | |
|------------------------|---------------------------|
| JP 2622316 B2 | JP 1991-132737 19910604 |
| KR 9702941 B1 | KR 1991-24106 19911224 |
| CA 2059733 C | CA 1992-2059733 19920121 |
| DE 69218811 E | DE 1992-69218811 19920121 |
| EP 497189 A3 | EP 1992-100938 19920121 |
| EP 497189 B1 | EP 1992-100938 19920121 |
| DE 69218811 E | EP 1992-100938 19920121 |
| KR 9608915 B1 | KR 1992-850 19920122 |
| US 5324566 A | US 1992-824287 19920123 |
| US 5437894 A Div Ex | US 1992-824287 19920123 |
| US 5437894 A | US 1994-186117 19940125 |
| JP 10146920 A | JP 1997-295058 19910205 |
| JP 3017965 B2 | JP 1997-295058 19910205 |
| JP 2000103007 A Div Ex | JP 1997-295058 19910205 |
| JP 3150133 B2 Div Ex | JP 1997-295058 19910205 |
| JP 10310455 A | JP 1998-80951 19910205 |
| JP 3444524 B2 | JP 1998-80951 19910205 |
| JP 2004002187 A Div Ex | JP 1998-80951 19910205 |
| JP 10309768 A | JP 1998-80952 19910205 |
| JP 3165672 B2 | JP 1998-80952 19910205 |
| JP 2001214156 A Div Ex | JP 1998-80952 19910205 |
| JP 2000103007 A | JP 1999-318905 19910205 |
| JP 3150133 B2 | JP 1999-318905 19910205 |
| JP 2001214156 A | JP 2000-344205 19910205 |
| JP 2004002187 A | JP 2003-132146 20030509 |

FILING DETAILS:

| PATENT NO | KIND | PATENT NO |
|----------------|---------------|-----------------|
| DE 69218811 E | Based on | EP 497189 A |
| JP 07086146 B2 | Based on | JP 04249146 A |
| JP 2500150 B2 | Previous Publ | JP 04255343 A |
| JP 2809889 B2 | Previous Publ | JP 04288349 A |
| JP 2622316 B2 | Previous Publ | JP 04359031 A |
| JP 3017965 B2 | Previous Publ | JP 10146920 A |
| JP 3165672 B2 | Previous Publ | JP 10309768 A |
| JP 3444524 B2 | Previous Publ | JP 10310455 A |
| JP 3150133 B2 | Previous Publ | JP 2000103007 A |
| US 5437894 A | Div ex | US 5324566 A |

PRIORITY APPLN. INFO: JP 1991-132737 19910604
 JP 1991-24023 19910123
 JP 1991-24024 19910123
 JP 1991-36773 19910205
 JP 1991-36775 19910205
 JP 1991-38133 19910206
 JP 1990-405755 19901225

INT. PATENT CLASSIF.:

MAIN: B05D003-06; B05D005-08; B32B017-10; B32B005-00;
 B32B007-00; B32B007-02; B32B009-00; C03C017-42;
 C08J007-04; C09D183-04; C09D183-08; C09K003-18
 SECONDARY: B01J019-00; B05D001-18; B05D001-20; B05D003-00;
 B05D003-02; B05D007-24; B32B027-00; B32B003-20;
 B32B031-00; B32B005-16; B32B007-04; C03C017-28;
 C03C017-30; C03C017-38; C08J007-12; C08L083-06;
 C08L083-08; G02B001-10
 ADDITIONAL: B32B027-30

BASIC ABSTRACT:

EP 497189 A2 UPAB: 20060107

A chemically adsorbed film has surface irregularities greater than 10 nanometers and has water- and oil-repelling properties. The film is formed on a **substrate** surface and is bonded to it (in)directly by covalent bonds. The compsn. of the film is a monomolecular/polymer film with the mols. containing fluorocarbon and siloxane gps.

Pref. the surface irregularities are from those (a) formed on the surface itself, (b) due to fine particles formed on the surface; or (c) due to fine particles in the film; the particles of (b) and (c) being hydrophilic. The **substrate** is pref. made of glass, ceramics, **metals**, plastics, wood, stone and semiconductors; the level of irregularities is pref. less than the wavelength of visible light; and is anti-contaminating.

USE/ADVANTAGE - The films can be used on electric prods., vehicles and industrial apparatus; prods. such as window glass, optical/glass lenses, porcelain, table dishes, vases and construcion materials as door/window sashes, plastic prods. such as furniture, decoration boards/panels, electric insulators and spark plugs. The coating film has strong adhesion to the **substrate** is free from pin holes, has required surface irregularities and is durable. When the **substrate** is a plastic film, the surface is coarsened with irregularities of less than 0.3 micrometers.

FILE SEGMENT: CPI; GMPI; EPI
 MANUAL CODE: CPI: A06-A00E1; A12-B01C; G02-A05; G02-A05B;
 L01-G04D; L02-D14Q; L03-J; M13-H
 EPI: X12-E02B; X22-A01E1C

L105 ANSWER 19 OF 19 WPIX COPYRIGHT 2006 THE THOMSON CORP on STN
 ACCESSION NUMBER: 1989-158770 [22] WPIX
 DOC. NO. CPI: C1989-070455 [21]
 DOC. NO. NON-CPI: N1989-121111 [21]
 TITLE: **Negative electrode** for sec.
battery - has **substrate**
 comprising current collector of enlarged surface
 bearing layer of alkali metal
 DERWENT CLASS: A85; L03; P73; X16
 INVENTOR: KABATA T; KIMURA O; OHSAWA T; YONEYAMA S
 PATENT ASSIGNEE: (RICO-C) RICOH KK
 COUNTRY COUNT: 2

PATENT INFORMATION:

| PATENT NO | KIND | DATE | WEEK | LA | PG | MAIN IPC |
|------------|------|----------|-----------|----|--------|------------|
| DE 3838329 | A | 19890524 | (198922)* | DE | 15[10] | |
| DE 3838329 | C | 19910124 | (199104) | DE | [10] | H01M004-60 |
| US 5162178 | A | 19921110 | (199248) | EN | 11[10] | H01M004-58 |

APPLICATION DETAILS:

| PATENT NO | KIND | APPLICATION | DATE |
|------------|----------|-----------------|----------|
| DE 3838329 | A | DE 1989-3838329 | 19891111 |
| US 5162178 | A CIP of | US 1990-483267 | 19900216 |
| US 5162178 | A | US 1990-632140 | 19901221 |

PRIORITY APPLN. INFO: JP 1988-95680 19880420
 JP 1987-283096 19871111
 JP 1987-283097 19871111

JP 1988-28923 19880212

INT. PATENT CLASSIF.:

MAIN: H01M004-58
MAIN/SEC.: B32B007-02; C08L065-00; C08L079-02; H01M004-40;
H01M004-60; H01M004-64

BASIC ABSTRACT:

DE 3838329 A UPAB: 20050819

In sec. **battery** with positive **substrate** comprising active polymeric material (I) negative **substrate** comprises current collector with enlarged surface and layer predominantly of alkali metal (II) on the collector.

(I) is pref. an N polymer, partic. polypyrrole, polyaniline, polyazulene, polycarbazole, polydiphenylbenzidine, or polyoyridine. Collector has holes through it, partic. total surface area of holes being 40-75% total area. Collector has leaf-form. Surface is enlarged by forming porous structure therein, by **roughening** surface with formation of tiny depressions and notches, or by forming small holes in it. Collector is of Al or alloy consisting mainly of Al. Layer consists only of (II), or is ion-conductive **polymer** layer containing (II) dispersed therein, or comprises (a) ion-conductive layer on current collector, and layer of (II) between the collector and polymer, or (b) (II) layer on current collector, and ion-conductive **polymer** layer arranged between the collector and (II) layer. (II) is Li or Li alloy. Negative and positive **substrates** lie one on top of the other alternately with a separator and are folded up, both **substrates** being in an electrolyte.

ADVANTAGE - Discharge characteristics are improved; stable voltage of **negative electrode** can be maintained, increasing reliability; weight of negative **substrate** is reduced; negative **substrate** is readily handled during construction of **battery**, increasing production of negative **substrate** and **battery**; formation of dendrites during repeated charging and discharging is inhibited.

FILE SEGMENT: CPI; GMPI; EPI
MANUAL CODE: CPI: A12-E06A; L03-E01B9
EPI: X16-B01X; X16-E02

=> fil hcap

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FILE COVERS 1907 - 6 Dec 2006 VOL 145 ISS 24
FILE LAST UPDATED: 5 Dec 2006 (20061205/ED)

MEI HUANG EIC1700 REM4B28 571-272-3952

06/12/2006

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L3 1 SEA FILE=REGISTRY 7440-02-0/RN
L4 1 SEA FILE=REGISTRY 7440-50-8/RN
L5 1 SEA FILE=REGISTRY 25067-58-7/RN
L6 1 SEA FILE=REGISTRY 25190-62-9/RN
L7 1 SEA FILE=REGISTRY 25233-30-1/RN
L8 1 SEA FILE=REGISTRY 25233-34-5/RN
L9 1 SEA FILE=REGISTRY 28774-98-3/RN
L10 1 SEA FILE=REGISTRY 30604-81-0/RN
L11 1 SEA FILE=REGISTRY 82451-56-7/RN
L12 1 SEA FILE=REGISTRY 96638-49-2/RN
L13 1 SEA FILE=REGISTRY 114239-80-4/RN
L14 197744 SEA FILE=REGISTRY PES/PCT
L15 35186 SEA FILE=REGISTRY POLF/PCT
L16 86114 SEA FILE=REGISTRY PA/PCT
L17 19145 SEA FILE=REGISTRY PC/PCT
L18 330728 SEA FILE=REGISTRY PACR/PCT
L19 330728 SEA FILE=REGISTRY L18 OR L18
L20 170729 SEA FILE=REGISTRY RAN=(,167770-48-1) L18 OR L18
L21 159999 SEA FILE=REGISTRY L19 NOT L20
L22 418955 SEA FILE=HCAPLUS L20
L23 68239 SEA FILE=HCAPLUS L21
L24 40640 SEA FILE=HCAPLUS POLYACRYLIC# OR POLYACRYLATE#
L25 QUE POLYMETHACRYLIC# OR POLYMETHACRYLATE# OR POLY(A) (ACRYLIC# OR ACRYLATE# OR METHACRYLIC# OR METHACRYLATE#) OR (POLY OR POLYM? OR COPOLYM? OR HOMOPOLYM? OR RESIN?) (2A) (ACRYLATE# OR METHACRYLATE# OR ACRYLIC# OR METHACRYLIC#)
L26 333576 SEA FILE=HCAPLUS L14
L27 QUE POLYESTER?
L28 493974 SEA FILE=HCAPLUS L15
L29 QUE POLYOLEFIN?
L30 QUE POLYETHYLENE# OR POLYETHENE# OR PE OR POLYPROPYLENE# OR POLYPROPENE# OR PP OR POLYBUTYLENE# OR POLYISOBUTYLENE# OR POLYBUTENE# OR POLYISOBUTENE#
L31 QUE POLY(W) (ETHYLENE# OR ETHENE# OR PROPYLENE# OR PROPENE# OR BUTYLENE# OR ISOBUTYLENE# OR BUTENE#)
L32 QUE (ETHYLEN## OR PROPYLEN## OR BUTYLEN## OR BUTEN## OR OLEFIN##) (A) (POLYMER? OR POLYM# OR HOMOPOLYMER? OR HOMOPOLYM# OR RESIN?)
L33 141155 SEA FILE=HCAPLUS L16
L34 QUE POLYAMIDE?
L35 29922 SEA FILE=HCAPLUS L17
L36 QUE POLYCARBONATE?
L37 QUE SUBSTRAT?
L38 71370 SEA FILE=HCAPLUS (NI OR CU OR L3 OR L4) (L) L37
L39 27369 SEA FILE=HCAPLUS (L5 OR L6 OR L7 OR L8 OR L9 OR L10 OR L11 OR L12 OR L13)
L40 QUE (NEGATIVE? OR NEG#) (A) ELECTROD## OR ANOD##
L41 QUE BATTERY OR BATTERIES
L42 QUE ROUGH?
L43 QUE ANGSTROM#
L44 40665 SEA FILE=HCAPLUS (LI OR LITHIUM) (2A) L41
L45 18436 SEA FILE=HCAPLUS L44 AND L40

L46 793 SEA FILE=HCAPLUS L45 AND L37
 L47 17 SEA FILE=HCAPLUS L46 AND (L42 OR L43)
 L48 13 SEA FILE=HCAPLUS L47 AND (L38 OR L39)
 L49 3 SEA FILE=HCAPLUS L47 AND (L22 OR L23 OR L24 OR L25 OR
 L26 OR L27 OR L28 OR L29 OR L30 OR L31 OR L32 OR L33 OR
 L34 OR L35 OR L36)
 L50 QUE CONDUCT?(2A) (POLYM? OR COPOLYM? OR HOMOPOLYM? OR RES
 IN?)
 L51 2 SEA FILE=HCAPLUS L47 AND L50
 L52 17 SEA FILE=HCAPLUS L51 OR L49 OR L48 OR L47
 L53 1 SEA FILE=REGISTRY 7439-93-2/RN
 L54 82611 SEA FILE=HCAPLUS L53
 L55 QUE ELECTROCHEMICAL?/SC,SX
 L56 4784 SEA FILE=HCAPLUS L54 AND L55 AND L40
 L57 39233 SEA FILE=HCAPLUS ?SMOOTH?(2A) SURFACE?
 L58 58 SEA FILE=HCAPLUS L56 AND (L42 OR L43 OR L57)
 L59 21 SEA FILE=HCAPLUS L58 AND (L38 OR L39 OR (L22 OR L23 OR
 L24 OR L25 OR L26 OR L27 OR L28 OR L29 OR L30 OR L31 OR
 L32 OR L33 OR L34 OR L35 OR L36) OR L50)
 L60 14 SEA FILE=HCAPLUS L59 AND (L42 OR L43)
 L61 1854 SEA FILE=HCAPLUS L41 AND L40 AND L37
 L62 42 SEA FILE=HCAPLUS L61 AND (L42 OR L43 OR L57)
 L63 26 SEA FILE=HCAPLUS L62 AND (L38 OR L39 OR (L22 OR L23 OR
 L24 OR L25 OR L26 OR L27 OR L28 OR L29 OR L30 OR L31 OR
 L32 OR L33 OR L34 OR L35 OR L36) OR L50)
 L64 18 SEA FILE=HCAPLUS L63 AND (L42 OR L43)
 L67 31 SEA FILE=HCAPLUS L52 OR L60 OR L64
 L112 29 SEA FILE=HCAPLUS (JP1991-36775/APPS OR WO1999-US6895/APPS
 L113 29 SEA FILE=HCAPLUS L67 NOT L112

=> d l113 ibib abs hitstr hitind 1-29

L113 ANSWER 1 OF 29 HCAPLUS COPYRIGHT 2006 ACS on STN
 ACCESSION NUMBER: 2006:1150247 HCAPLUS
 DOCUMENT NUMBER: 145:474803
 TITLE: Alkaline battery anode
 casing
 INVENTOR(S): Guo, Jingdong; Hedman, Jonathan W.
 PATENT ASSIGNEE(S): USA
 SOURCE: U.S. Pat. Appl. Publ., 13pp.
 CODEN: USXXCO
 DOCUMENT TYPE: Patent
 LANGUAGE: English
 FAMILY ACC. NUM. COUNT: 1
 PATENT INFORMATION:

| PATENT NO. | KIND | DATE | APPLICATION NO. | DATE |
|---------------|------|----------|-----------------|----------|
| US 2006246353 | A1 | 20061102 | US 2006-408093 | 20060420 |
| WO 2006118791 | A1 | 20061109 | WO 2006-US14687 | 20060420 |

W: AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BW, BY, BZ, CA,
 CH, CN, CO, CR, CU, CZ, DE, DK, DM, DZ, EC, EE, EG, ES, FI,
 GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KM,

KN, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, LY, MA, MD, MG,
 MK, MN, MW, MX, MZ, NA, NG, NI, NO, NZ, OM, PG, PH, PL, PT,
 RO, RU, SC, SD, SE, SG, SK, SL, SM, SY, TJ, TM, TN, TR, TT,
 TZ, UA, UG, US, UZ, VC, VN, YU, ZA, ZM, ZW
 RW: AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HU,
 IE, IS, IT, LT, LU, LV, MC, NL, PL, PT, RO, SE, SI, SK, TR,
 BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD,
 TG, BW, GH, GM, KE, LS, MW, MZ, NA, SD, SL, SZ, TZ, UG, ZM,
 ZW, AM, AZ, BY, KG, KZ, MD, RU, TJ, TM

PRIORITY APPLN. INFO.:

US 2005-676114P

P

200504

29

AB The invention is an electrochem. cell with a zinc-containing **neg**
 . **electrode**, an aqueous alkaline electrolyte and a cup-shaped
 metal **neg. electrode** casing in contact with the
neg. electrode. The **neg.**
electrode casing is formed from a **substrate** that
 is substantially free of copper and at least those portions of the
 surface of the **neg. electrode** casing in the seal
 area and the current collector area are coated with a layer of an
 alloy comprising copper, tin and zinc. The alloy layer reduces
 hydrogen gassing within the cell and is particularly useful in cells
 with no added mercury. Embodiments of the invention include cells
 with prismatic, cylindrical and button shaped containers and cells
 with pos. electrode active materials including manganese dioxide,
 silver oxide and oxygen.

IT 9003-01-4, Polyacrylic acid

RL: MOA (Modifier or additive use); USES (Uses)
 (alkaline **battery anode** casing)

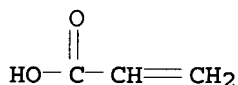
RN 9003-01-4 HCAPLUS

CN 2-Propenoic acid, homopolymer (9CI) (CA INDEX NAME)

CM 1

CRN 79-10-7

CMF C3 H4 O2



INCL 429245000; 429174000; 429176000; 429224000; 429219000; 429229000
 CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)
 Section cross-reference(s): 56, 63

ST **anode** casing alk **battery**

IT **Battery anodes**

Primary **batteries**

Seals (parts)

Surface **roughness**

(alkaline **battery anode** casing)

IT Polysiloxanes, uses

RL: MOA (Modifier or additive use); USES (Uses)
 (alkaline **battery anode** casing)

IT Containers

(boxes; alkaline **battery anode** casing)

IT Primary **batteries**

(button-type; alkaline **battery anode** casing)

IT Hearing loss
(hearing aids; alkaline **battery anode** casing)

IT 1310-58-3, Potassium hydroxide, uses 1313-13-9, Manganese dioxide, uses 7440-50-8, Copper, uses 7440-66-6, Zinc, uses 7782-44-7, Oxygen, uses 20667-12-3, Silver oxide 913648-89-2
RL: DEV (Device component use); USES (Uses)
(alkaline **battery anode** casing)

IT 1314-13-2, Zinc oxide (ZnO), uses 9003-01-4, Polyacrylic acid 9004-74-4, Carbowax 550 9007-16-3, Carbopol 934 20661-21-6, Indium hydroxide 913649-61-3, Carbopol EX 65
RL: MOA (Modifier or additive use); USES (Uses)
(alkaline **battery anode** casing)

IT 7440-02-0, Nickel, uses 12597-68-1, Stainless steel, uses 73235-25-3 495374-12-4 913648-88-1
RL: TEM (Technical or engineered material use); USES (Uses)
(alkaline **battery anode** casing)

IT 913648-90-5
RL: TEM (Technical or engineered material use); USES (Uses)
(coating; alkaline **battery anode** casing)

IT 12597-69-2, Steel, uses
RL: TEM (Technical or engineered material use); USES (Uses)
(**substrate**; alkaline **battery anode** casing)

L113 ANSWER 2 OF 29 HCAPLUS COPYRIGHT 2006 ACS on STN

ACCESSION NUMBER: 2006:899909 HCAPLUS

TITLE: High capacity and long cycle life silicon
**anode for Li-ion
battery**

AUTHOR(S): Takamura, Tsutomu; Uehara, Makiko; Suzuki, Junji; Sekine, Kyoichi; Tamura, Koki

CORPORATE SOURCE: Department of Applied Chemistry, Harbin
Institute of Technology, Harbin, Peop. Rep.
China

SOURCE: Journal of Power Sources (2006), 158(2),
1401-1404

CODEN: JPSODZ; ISSN: 0378-7753

PUBLISHER: Elsevier B.V.

DOCUMENT TYPE: Journal

LANGUAGE: English

AB A silicon film was deposited on a **Ni** or **Cu** foil in vacuum up to a thickness of 4 μm and the Li insertion/extraction behavior was evaluated under constant current charge/discharge in an electrolyte solution of propylene carbonate containing 1 M LiClO_4 . The surface of a 30 μm thick **Ni** foil was **roughened** by etching with FeCl_3 . The Li insertion/extraction performance was strongly dependent on the **roughness** factor. A thick silicon film is necessary for practical application. However, the cycle performance as well as the Li accommodation capacity was markedly depressed when the film thickness was increased. We found that the **roughening** of the **substrate** surface was a key factor for attaining good performance with a thick film. Surface **roughening** was found to be very effective, but the best performance was obtained by the use of an electrolytically deposited **Cu** foil on which a silicon film was vacuum-deposited rapidly.

CC 52 (Electrochemical, Radiational, and Thermal Energy Technology)

REFERENCE COUNT: 17 THERE ARE 17 CITED REFERENCES AVAILABLE
FOR THIS RECORD. ALL CITATIONS AVAILABLE

IN THE RE FORMAT

L113 ANSWER 3 OF 29 HCAPLUS COPYRIGHT 2006 ACS on STN

ACCESSION NUMBER: 2006:514414 HCAPLUS

TITLE: **Substrate** effect on the microstructure and electrochemical properties of LiCoO₂ thin films grown by PLD

AUTHOR(S): Xia, Hui; Lu, Li; Ceder, G.

CORPORATE SOURCE: Singapore-MIT Alliance, Advanced Materials for Micro- and Nano-System, Singapore, 117576, Singapore

SOURCE: Journal of Alloys and Compounds (2006), 417(1-2), 304-310

CODEN: JALCEU; ISSN: 0925-8388

PUBLISHER: Elsevier B.V.

DOCUMENT TYPE: Journal

LANGUAGE: English

AB LiCoO₂ thin films were grown by pulsed laser deposition (PLD) on stainless steel (SS) and SiO₂/Si (SOS) **substrates**. The structure properties of LiCoO₂ thin films on both **substrates** were studied. The electrochem. properties of LiCoO₂ thin films on both **substrates** were studied by cyclic voltammetry (CV) and charge-discharge against a Li anode. Thin films on SS **substrates** showed rough surfaces and random orientation, while those on SOS **substrates** showed relatively smooth surfaces and preferred (0 0 3) out-of-plane orientation. Cyclic voltammograms (CVs) of randomly oriented thin films on SS **substrates** showed wide peaks at .apprx.3.9 V which correspond to the 1st order phase transition, while CVs of preferred (0 0 3)-oriented thin films on SOS **substrates** showed sharp, well-defined peaks due to their more uniform texture. Charge-discharge measurements indicated that the thin films on SS **substrates** had higher utilizations but lower capacity retentions, while the thin films on SOS **substrates** had lower utilizations but better capacity retentions. We believe that the thin film with random orientation has faster mass transport of Li ions while the thin film with preferred (0 0 3) orientation has better structure stability.

CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)

IT Secondary batteries

(lithium; **substrate** effect on microstructure and electrochem. properties of cobalt lithium oxide thin films grown by cobalt lithium oxide)

IT Laser radiation

(pulsed; **substrate** effect on microstructure and electrochem. properties of cobalt lithium oxide thin films grown by cobalt lithium oxide)

IT Battery cathodes

Films

Microstructure

Phase transition

Vapor deposition process

(**substrate** effect on microstructure and electrochem. properties of cobalt lithium oxide thin films grown by cobalt lithium oxide)

IT 7440-21-3, Silicon 7631-86-9, Silica 12190-79-3, Cobalt lithium oxide (CoLiO₂) 12597-68-1, Stainless steel

RL: DEV (Device component use); USES (Uses)

(**substrate** effect on microstructure and electrochem. properties of cobalt lithium oxide thin films grown by cobalt

lithium oxide)

REFERENCE COUNT: 24 THERE ARE 24 CITED REFERENCES AVAILABLE
FOR THIS RECORD. ALL CITATIONS AVAILABLE
IN THE RE FORMAT

L113 ANSWER 4 OF 29 HCAPLUS COPYRIGHT 2006 ACS on STN

ACCESSION NUMBER: 2006:510451 HCAPLUS

DOCUMENT NUMBER: 145:30864

TITLE: Secondary nickel-hydrogen battery and
manufacture of anode thereofINVENTOR(S): Okawa, Takashi; Murakami, Tsuneyoshi; Aoki,
Kenichi; Usui, Hiroyuki

PATENT ASSIGNEE(S): Matsushita Electric Industrial Co., Ltd., Japan

SOURCE: PCT Int. Appl., 13 pp.

CODEN: PIXXD2

DOCUMENT TYPE: Patent

LANGUAGE: Japanese

FAMILY ACC. NUM. COUNT: 1

PATENT INFORMATION:

| PATENT NO. | KIND | DATE | APPLICATION NO. | DATE |
|---|------|----------|-----------------|-------------------|
| WO 2006057279 | A1 | 20060601 | WO 2005-JP21536 | 200511 24 |
| W: AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BW, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, KE, KG, KM, KN, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, LY, MA, MD, MG, MK, MN, MW, MX, MZ, NA, NG, NI, NO, NZ, OM, PG, PH, PL, PT, RO, RU, SC, SD, SE, SG, SK, SL, SM, SY, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, YU, ZA, ZM, ZW RW: AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HU, IE, IS, IT, LT, LU, LV, MC, NL, PL, PT, RO, SE, SI, SK, TR, BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG, BW, GH, GM, KE, LS, MW, MZ, NA, SD, SL, SZ, TZ, UG, ZM, ZW, AM, AZ, BY, KG, KZ, MD, RU, TJ, TM | | | | |
| JP 2006156005 | A2 | 20060615 | JP 2004-342204 | 200411 26 |
| PRIORITY APPLN. INFO.: JP 2004-342204 | | | | A 200411 26 |

AB The battery has a coiled electrode stack, containing a separator between a Ni(OH)₂ active mass-containing cathode and an anode having a H-absorbing alloy-containing mixture layer on a conductive substrate and stored in a bottomed cylindrical container; where in the battery, the surface roughness, in terms of ten-point average roughness, of mixture layer of the outermost periphery of anode (1) brought into contact with the side internal wall of the bottomed cylindrical container is $\geq 3.5 \mu\text{m}$, greater than the surface roughness of other parts of the anode mixture layer. A method for manufacturing the anode is also disclosed.

CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)

ST secondary nickel hydrogen battery anode manuf
hydrogen absorbing alloy

IT **Battery anodes**
Secondary batteries
(structure of secondary nickel-hydrogen **batteries** and
manufacture of **anodes**)

IT 181147-99-9
RL: DEV (Device component use); USES (Uses)
(structure of secondary nickel-hydrogen **batteries** and
manufacture of **anodes**)

REFERENCE COUNT: 4 THERE ARE 4 CITED REFERENCES AVAILABLE FOR
THIS RECORD. ALL CITATIONS AVAILABLE IN
THE RE FORMAT

L113 ANSWER 5 OF 29 HCAPLUS COPYRIGHT 2006 ACS on STN

ACCESSION NUMBER: 2006:175983 HCAPLUS

DOCUMENT NUMBER: 144:415820

TITLE: Effects of **Cu** current collector as a
substrate on electrochemical properties
of Li/Si thin film cells

AUTHOR(S): Bong, Cho Gyu; Ki, Lee Bong; Chul, Sin Won; Koo,
Cho Kwon; Jun, Ahn Hyo; Hyun, Nam Tae; Won, Kim
Ki

CORPORATE SOURCE: Information Technology Research Center for
Energy Storage and Conversion, Gyeongsang
National University, Jinju, Gyeongnam, 660-701,
S. Korea

SOURCE: Journal of Materials Science (2006), 41(2),
313-315

CODEN: JMTSAS; ISSN: 0022-2461

PUBLISHER: Springer

DOCUMENT TYPE: Journal

LANGUAGE: English

AB Si is a promising **anode** material for Li microbatteries and
Cu foil has been used as a current collector and
substrate for thin-film **batteries**. A prolonged
lifetime was achieved with Li/amorphous Si film and a mech.-
roughened Cu foil substrate. The
rough surface of the **substrate** enhanced the
adhesive force between the active material and the current
collector. In this study a rolling process was applied to
roughen the surface of a **Cu** foil and to change its
microstructure. It was found that the electrochem. performance of a
Li/Si film battery cell is not simply improved by
a **roughened Cu foil**, the structural properties
of the **substrate** as a current collector must also be
considered to improve the cycleability of **Li/Si film**
batteries.

IT 7439-93-2, Lithium, uses

RL: DEV (Device component use); USES (Uses)
(effect of **Cu** current collector on electrochem. properties of
silicon **anodes** for lithium microbatteries)

RN 7439-93-2 HCAPLUS

CN Lithium (7CI, 8CI, 9CI) (CA INDEX NAME)

Li

CC 52-2 (Electrochemical, Radiational, and Thermal Energy
Technology)

ST copper current collector **substrate** silicon lithium

microbattery
 IT Electric current
 (collector; effect of Cu current collector on electrochem. properties of silicon **anodes** for lithium microbatteries)
 IT **Battery anodes**
 (effect of Cu current collector on electrochem. properties of silicon **anodes** for lithium microbatteries)
 IT Surface **roughness**
 (in effect of Cu current collector on electrochem. properties of silicon **anodes** for lithium microbatteries)
 IT Secondary **batteries**
 (lithium; effect of Cu current collector on electrochem. properties of silicon **anodes** for lithium microbatteries)
 IT 7439-93-2, Lithium, uses 7440-21-3, Silicon, uses 7440-50-8, Copper, uses
 RL: DEV (Device component use); USES (Uses)
 (effect of Cu current collector on electrochem. properties of silicon **anodes** for lithium microbatteries)

REFERENCE COUNT: 8 THERE ARE 8 CITED REFERENCES AVAILABLE FOR THIS RECORD. ALL CITATIONS AVAILABLE IN THE RE FORMAT

L113 ANSWER 6 OF 29 HCAPLUS COPYRIGHT 2006 ACS on STN

ACCESSION NUMBER: 2006:156070 HCAPLUS

DOCUMENT NUMBER: 144:373010

TITLE: Improvement of electrochemical capability of sputtered silicon film **anode** for rechargeable **lithium batteries**

AUTHOR(S): Komaba, Shinichi; Mikami, Fuminobu; Itabashi, Tatsuya; Baba, Mamoru; Ueno, Taku; Kumagai, Naoaki

CORPORATE SOURCE: Department of Frontier Materials and Functional Engineering, Graduate School of Engineering, Iwate University, 4-3-5 Ueda, Morioka, 020-8551, Japan

SOURCE: Bulletin of the Chemical Society of Japan (2006), 79(1), 154-162

CODEN: BCSJA8; ISSN: 0009-2673

PUBLISHER: Chemical Society of Japan

DOCUMENT TYPE: Journal

LANGUAGE: English

AB To improve the electrochem. properties of Si film **anodes** in **Li batteries**, 3 types of Si based-films were prepared - intrinsic Si, n-type Si, and Ag₁₀Si₉₀ binary films - using r.f. magnetron sputtering. According to galvanostatic charge-discharge tests and a.c. impedance measurements, the n-type Si film and Ag₁₀Si₉₀ binary films had a better cycle life and lower electrochem. resistance than intrinsic Si films. The potential variation in the electrochem. alloying/de-alloying reactions of the Ag₁₀Si₉₀ binary film with Li was different from that of the intrinsic Si film, meaning that the Ag ingredient in the binary film affected the charge-discharge reaction. When a **Ni foil**, roughened by chemical etching, was used as a **substrate**, the Ag₁₀Si₉₀ film **anode** had good capacity retention during 400 cycles with a high discharge capacity of >200 $\mu\text{A-h/cm}^2$ (corresponding to 1500 mA-h/g) at 0.5 mA/cm² (2.5 C).

IT 7440-02-0, Nickel, uses
 RL: DEV (Device component use); USES (Uses)

(silicon film **substrate**; in improvement of electrochem. characteristics of sputtered silicon film **anodes** for **lithium batteries**)

RN 7440-02-0 HCAPLUS

CN Nickel (8CI, 9CI) (CA INDEX NAME)

Ni

CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)
Section cross-reference(s): 72

ST sputtered silicon film **anode** nickel **substrate**
lithium battery

IT **Battery anodes**
(improvement of electrochem. characteristics of sputtered silicon film **anodes** for **lithium batteries**)

IT Secondary **batteries**
(**lithium**; improvement of electrochem. characteristics of sputtered silicon film **anodes** for **lithium batteries**)

IT Films
(sputter-deposited; improvement of electrochem. characteristics of sputtered silicon film **anodes** for **lithium batteries**)

IT 881896-63-5, Silver silicide (AgSi9)
RL: DEV (Device component use); USES (Uses)
(improvement of electrochem. characteristics of sputtered silicon film **anodes** for **lithium batteries**)

IT 7440-21-3, Silicon, uses
RL: DEV (Device component use); USES (Uses)
(intrinsic and n-type; improvement of electrochem. characteristics of sputtered silicon film **anodes** for **lithium batteries**)

IT 7440-02-0, Nickel, uses
RL: DEV (Device component use); USES (Uses)
(silicon film **substrate**; in improvement of electrochem. characteristics of sputtered silicon film **anodes** for **lithium batteries**)

REFERENCE COUNT: 22 THERE ARE 22 CITED REFERENCES AVAILABLE
FOR THIS RECORD. ALL CITATIONS AVAILABLE
IN THE RE FORMAT

L113 ANSWER 7 OF 29 HCAPLUS COPYRIGHT 2006 ACS on STN

ACCESSION NUMBER: 2005:1190327 HCAPLUS

DOCUMENT NUMBER: 145:30769

TITLE: Three-dimensional thin-film Li-ion
microbatteries for autonomous MEMS

AUTHOR(S): Nathan, Menachem; Golodnitsky, Diana; Yufit,
Vladimir; Strauss, Ela; Ripenbein, Tania;
Shechtman, Inna; Menkin, Svetlana; Peled,
Emanuel

CORPORATE SOURCE: Department of Physical Electronics, School of
Electrical Engineering, Tel Aviv University, Tel
Aviv-Jaffa, 69978, Israel

SOURCE: Journal of Microelectromechanical Systems
(2005), 14(5), 879-885

PUBLISHER: CODEN: JMIYET; ISSN: 1057-7157
Institute of Electrical and Electronics
Engineers

DOCUMENT TYPE: Journal
LANGUAGE: English

AB Autonomous MEMS require similarly miniaturized power sources. In this paper, we present the first working three-dimensional (3-D) rechargeable Li-ion thin-film microbattery technol. that is compatible with MEMS requirements. The technol. has been developed, and full 3-D cells have been manufactured on both glass and silicon **substrates**. Our 3-D microbatteries have a sandwich-like structure of conformal thin-film electrodes, electrolyte and current collectors. The films are deposited sequentially on all available surfaces of a perforated **substrate** (e.g., silicon or a glass microchannel plate or "MCP") using wet chemical. The **substrate** has thousands of high-aspect ratio holes per square cm, thereby providing more than an order of magnitude increase in surface area per given footprint (original 2-D **substrate** area). The full 3-D cell consists of a Ni cathode current collector, a MoOySz cathode, a hybrid polymer electrolyte (HPE) and a lithiated graphite **anode** that also serves as **anode** current collector. One 3-D cell with a **roughly** 1- μ m-thick cathode ran at C/10 to 2C charge/discharge rates and room temperature for 200 cycles with 0.2% per cycle capacity loss and about 100% Faradaic efficiency. The cell exhibited a capacity of 2 mAh/cm², about 30 times higher than the capacity of a similarly built planar (2-D) cell with the same footprint and same cathode thickness.

CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)

IT Secondary batteries

(lithium; three-dimensional thin-film Li-ion microbatteries for autonomous MEMS)

IT 7782-42-5, Graphite, uses

RL: DEV (Device component use); USES (Uses)

(lithiated; **anode** in three-dimensional thin-film Li-ion microbatteries for autonomous MEMS)

REFERENCE COUNT: 20 THERE ARE 20 CITED REFERENCES AVAILABLE FOR THIS RECORD. ALL CITATIONS AVAILABLE IN THE RE FORMAT

L113 ANSWER 8 OF 29 HCAPLUS COPYRIGHT 2006 ACS on STN

ACCESSION NUMBER: 2005:1056570 HCAPLUS

DOCUMENT NUMBER: 145:106569

TITLE: Characterization of surface film formation on Li metal **anode** by means of electrochemical quartz crystal microbalance

AUTHOR(S): Naoi, Katsuhiko; Mori, Mitsuhiro

CORPORATE SOURCE: Graduate School of Technology, Tokyo University of Agriculture and Technology, Tokyo, 184-8588, Japan

SOURCE: Materials Chemistry in Lithium Batteries (2002), 149-164. Editor(s): Kumagai, Naoaki; Komaba, Shinichi; Wakiyama, Masataka. Research Signpost: Trivandrum, India. CODEN: 69HKQG; ISBN: 81-7736-115-5

DOCUMENT TYPE: Conference; General Review

LANGUAGE: English

AB A review (23 refs.). Li metal **anode** was characterized by means of the in situ quartz crystal microbalance (QCM) and modified by imide anion [e.g. -N(C₂F₅SO₂)₂: BETI] and nonionic surfactant [e.g. poly(ethylene glycol di-Et ether): PEGDME]. As for the surface characterization, we revealed the formation and destruction for the surface film existing on the

metallic Li by using the QCM. Frequency shift and resonance resistance in the QCM gave directly us an useful information about mass change and **roughness** change, resp. To achieve high columbic efficiency, Li surface was modified successfully by BETI and PEGDME, which gave stable film and **smooth surface** during charge-discharge cycles. The surface film formed in LiBETI system was hemispherical, and the composition of the film consisted mainly of LiF, which was produced by the reaction between adsorped BETI anion and Li metal. In the presence of PEGDME, the extent of inactive Li was diminished markedly, and the surface film may partly consist of the PEGDME mols. including ethylene oxide groups.

IT 7439-93-2, Lithium, uses
RL: DEV (Device component use); NUU (Other use, unclassified); TEM (Technical or engineered material use); USES (Uses)
(characterization of surface film formation on Li metal anode by electrochem. quartz crystal microbalance)
RN 7439-93-2 HCAPLUS
CN Lithium (7CI, 8CI, 9CI) (CA INDEX NAME)

Li

CC 52-0 (**Electrochemical**, Radiational, and Thermal Energy Technology)
Section cross-reference(s): 56
ST review surface film lithium **anode** electrochem quartz microbalance
IT Battery **anodes**
Microbalances
(characterization of surface film formation on Li metal anode by electrochem. quartz crystal microbalance)
IT 7439-93-2, Lithium, uses 14808-60-7, Quartz, uses 53609-62-4, **Poly(ethylene glycol diethyl ether** 132843-44-8, Lithium bis(pentafluoroethylsulfonyl)imide
RL: DEV (Device component use); NUU (Other use, unclassified); TEM (Technical or engineered material use); USES (Uses)
(characterization of surface film formation on Li metal anode by electrochem. quartz crystal microbalance)
REFERENCE COUNT: 23 THERE ARE 23 CITED REFERENCES AVAILABLE FOR THIS RECORD. ALL CITATIONS AVAILABLE IN THE RE FORMAT

L113 ANSWER 9 OF 29 HCAPLUS COPYRIGHT 2006 ACS on STN
ACCESSION NUMBER: 2005:1002587 HCAPLUS
DOCUMENT NUMBER: 144:90990
TITLE: Thick vacuum deposited silicon films suitable for the **anode** of Li-ion **battery**
AUTHOR(S): Uehara, Makiko; Suzuki, Junji; Tamura, Kohki; Sekine, Kyoichi; Takamura, Tsutomu
CORPORATE SOURCE: Department of Chemistry, Rikkyo University, Nishiikebukuro, Toshimaku, Tokyo, 117-8501, Japan
SOURCE: Journal of Power Sources (2005), 146(1-2), 441-444
CODEN: JPSODZ; ISSN: 0378-7753
PUBLISHER: Elsevier B.V.
DOCUMENT TYPE: Journal

LANGUAGE: English

AB Vacuum deposited silicon film on a **Ni** foil **substrate** showed very stable Li charge/discharge performance in propylene carbonate containing 1M LiClO₄. The performance, however, became poorer rapidly with the increase in the film thickness. In an attempt to attain long cycleability with large capacity for the vacuum deposited thicker silicon film, surface morphol. of the depositing **substrate** metal was examined. Filing with a sand paper was quite effective for providing longer cycleability as compared to the pristine **Ni** foil. Etching with aqueous solution of FeCl₃ resulted in **roughening** of the surface to a great extent. A 1.1 μ m thick silicon film deposited on the well-etched **substrate** maintained sp. capacity >1500 mA-h/g even after 400 cycles at 1C rate constant current charge/discharge. The most **roughened** surface could be obtained by depositing silicon electrolytically on a copper foil. The surface revealed a jammed group of tiny pyramid like steeple-crowned caps. A 3.6 μ m thick silicon film deposited on the copper **substrate** maintained sp. capacity .apprx.2000 mA-h/g during 50 cycles.

IT 7440-50-8, Copper, uses

RL: DEV (Device component use); USES (Uses)

(foil; characterization of thick vacuum deposited silicon films on copper foil **substrate** for use as **anode** of **lithium-ion batteries**)

RN 7440-50-8 HCAPLUS

CN Copper (7CI, 8CI, 9CI) (CA INDEX NAME)

Cu

IT 7440-02-0, Nickel, uses

RL: DEV (Device component use); USES (Uses)

(foil; characterization of thick vacuum deposited silicon films on nickel foil **substrate** for use as **anode** of **lithium-ion batteries**)

RN 7440-02-0 HCAPLUS

CN Nickel (8CI, 9CI) (CA INDEX NAME)

Ni

CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)

ST silicon film **anode** **lithium ion battery**

IT **Battery anodes**

(characterization of thick vacuum deposited silicon films suitable for **anode** of **lithium-ion batteries**)

IT 7440-21-3, Silicon, uses

RL: DEV (Device component use); USES (Uses)

(characterization of thick vacuum deposited silicon films suitable for **anode** of **lithium-ion batteries**)

IT 7705-08-0, Ferric chloride, uses

RL: NUU (Other use, unclassified); USES (Uses)

(etchant; characterization of thick vacuum deposited silicon films suitable for **anode** of **lithium-ion batteries**)

IT 7440-50-8, Copper, uses

RL: DEV (Device component use); USES (Uses)
 (foil; characterization of thick vacuum deposited silicon films
 on copper foil **substrate** for use as **anode** of
lithium-ion batteries)

IT 7440-02-0, Nickel, uses

RL: DEV (Device component use); USES (Uses)
 (foil; characterization of thick vacuum deposited silicon films
 on nickel foil **substrate** for use as **anode** of
lithium-ion batteries)

REFERENCE COUNT: 8 THERE ARE 8 CITED REFERENCES AVAILABLE FOR
 THIS RECORD. ALL CITATIONS AVAILABLE IN
 THE RE FORMAT

L113 ANSWER 10 OF 29 HCAPLUS COPYRIGHT 2006 ACS on STN

ACCESSION NUMBER: 2004:931986 HCAPLUS

DOCUMENT NUMBER: 141:382184

TITLE: Solid state polymer electrolyte **battery**
 and its manufacture

INVENTOR(S): Uemura, Ryuzo; Senbokuya, Ryoichi; Osawa,
 Yasuhiko

PATENT ASSIGNEE(S): Nissan Motor Co., Ltd., Japan

SOURCE: Jpn. Kokai Tokkyo Koho, 25 pp.

CODEN: JKXXAF

DOCUMENT TYPE: Patent

LANGUAGE: Japanese

FAMILY ACC. NUM. COUNT: 1

PATENT INFORMATION:

| PATENT NO. | KIND | DATE | APPLICATION NO. | DATE |
|---------------------------------------|------|----------|-----------------|--------------|
| JP 2004311108 | A2 | 20041104 | JP 2003-100642 | 200304 03 |
| PRIORITY APPLN. INFO.: JP 2003-100642 | | | | 200304 03 |

AB The **battery** has cathode and/or **anode** composed of
 materials having particle diameter $\leq 8 \mu\text{m}$ and/or have surface
roughness $\leq 1.4 \mu\text{m}$. The **battery** is
 prepared by applying a polymer electrolyte precursor solution on a
 cathode and/or an **anode**, attaching a transparent
substrate on the electrode, irradiating the electrode from
 the **substrate** side to cure the electrolyte, and removing
 the **substrate**.

IC ICM H01M010-40

ICS H01M004-02; H01M010-36

CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)

ST solid state polymer electrolyte **battery** structure manuf;
 electrode material particle size solid state polymer electrolyte
battery; surface **roughness** electrode solid state
 polymer electrolyte **battery**

IT Secondary **batteries**

(**lithium**; structure and manufacture of secondary solid state
 polymer electrolyte **lithium batteries**)

IT Carbon black, uses

RL: DEV (Device component use); PEP (Physical, engineering or
 chemical process); PRP (Properties); PYP (Physical process); PROC
 (Process); USES (Uses)

(structure and manufacture of secondary solid state polymer electrolyte **lithium batteries**)

IT 12031-95-7, Lithium titanate (Li₄Ti₅O₁₂) 12057-17-9, Lithium manganese oxide (LiMn₂O₄)
 RL: DEV (Device component use); PEP (Physical, engineering or chemical process); PRP (Properties); PYP (Physical process); PROC (Process); USES (Uses)
 (structure and manufacture of secondary solid state polymer electrolyte **lithium batteries**)

IT 9003-11-6, **Poly(ethylene oxide)-poly(propylene oxide)** copolymer 132843-44-8
 RL: DEV (Device component use); PEP (Physical, engineering or chemical process); PYP (Physical process); PROC (Process); USES (Uses)
 (structure and manufacture of secondary solid state polymer electrolyte **lithium batteries**)

L113 ANSWER 11 OF 29 HCAPLUS COPYRIGHT 2006 ACS on STN

ACCESSION NUMBER: 2004:295615 HCAPLUS

DOCUMENT NUMBER: 141:91699

TITLE: A vacuum deposited Si film having a Li extraction capacity over 2000 mAh/g with a long cycle life

AUTHOR(S): Takamura, Tsutomu; Ohara, Shigeki; Uehara, Makiko; Suzuki, Junji; Sekine, Kyoichi

CORPORATE SOURCE: Department of Applied Chemistry, Harbin Institute of Technology, Harbin, 150001, Peop. Rep. China

SOURCE: Journal of Power Sources (2004), 129(1), 96-100
 CODEN: JPSODZ; ISSN: 0378-7753

PUBLISHER: Elsevier Science B.V.

DOCUMENT TYPE: Journal

LANGUAGE: English

AB A Si film, vacuum-deposited on a Ni foil, has a Li insertion capacity over 2000 mA-h/g with a cycleability of >1000 cycles. It was however difficult to obtain a sufficiently thick film for high-current charge/discharge. The high-current charge/discharge performance of thicker Si films in relation to film formation conditions was studied. The electrochem. evaluation was performed with cyclic voltammetry and constant current charge/discharge tests with various loading currents using PC electrolyte containing 1M LiClO₄. A Si film prepared at a rapid deposition rate gave a discharge capacity of >2000 mA-h/g, even at a charge/discharge rate of >10 C. In addition, surface **roughening** of the **substrate** foil was important to ensure a thick film capable of high current performance. The constant discharge curve gave a wide plateau in the potential range 200 - 500 mV vs. Li/Li⁺. XRD of the deposited film showed no peaks due to Si, indicating that the film is amorphous. The SEM image of the deposited film was featureless and after 500 cycles the film still covered the entire surface of the **Ni substrate**, but the surface became inhomogeneous.

IT 7440-02-0, Nickel, uses

RL: DEV (Device component use); USES (Uses)
 (**substrate**; thick vacuum-deposited Si film
anodes on surface **roughened** nickel for
lithium batteries)

RN 7440-02-0 HCAPLUS

CN Nickel (8CI, 9CI) (CA INDEX NAME)

Ni

CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)
ST silicon film **anode** vacuum deposition nickel
substrate lithium battery

IT **Battery anodes**
(thick vacuum-deposited Si film **anodes** on surface
roughened nickel for lithium batteries
)

IT Vapor deposition process
(vacuum; thick vacuum-deposited Si film **anodes** on
surface **roughened nickel for lithium**
batteries)

IT 7440-02-0, Nickel, uses
RL: DEV (Device component use); USES (Uses)
(**substrate**; thick vacuum-deposited Si film
anodes on surface **roughened nickel for**
lithium batteries)

IT 7440-21-3, Silicon, uses
RL: DEV (Device component use); USES (Uses)
(thick vacuum-deposited Si film **anodes** on surface
roughened nickel for lithium batteries
)

REFERENCE COUNT: 11 THERE ARE 11 CITED REFERENCES AVAILABLE
FOR THIS RECORD. ALL CITATIONS AVAILABLE
IN THE RE FORMAT

L113 ANSWER 12 OF 29 HCAPLUS COPYRIGHT 2006 ACS on STN

ACCESSION NUMBER: 2003:483076 HCAPLUS

DOCUMENT NUMBER: 139:232953

TITLE: Effect of poly(vinylidene fluoride) binder
crystallinity and graphite structure on the
mechanical strength of the composite
anode in a lithium ion
battery

AUTHOR(S): Yoo, Mikyong; Frank, Curtis W.; Mori, Shoichiro;
Yamaguchi, Shoji

CORPORATE SOURCE: Department of Materials Science and Engineering,
Stanford University, Stanford, CA, 94305, USA

SOURCE: Polymer (2003), 44(15), 4197-4204

CODEN: POLMAG; ISSN: 0032-3861

PUBLISHER: Elsevier Science Ltd.

DOCUMENT TYPE: Journal

LANGUAGE: English

AB The authors have evaluated the mech. strength of composites
consisting of carbon particles bound together by poly(vinylidene
fluoride) (PVDF), which is closely related to the carbonaceous
anode in a lithium ion battery. The
authors used a balanced beam scrape adhesion tester and evaluated
the influence of carbon particle structure, the chemical properties of
PVDF, and the processing parameters of annealing temperature and casting
solvent on the adhesion of the composite film to a copper
substrate. The composite prepared with amorphous carbon shows
over 10 times higher adhesion strength than those fabricated from
other graphite materials. This results from chemical binding that is
intermediate between semi-ionic and covalent C-F bonds, as detected
by XPS. To address the effect of the crystalline phase of the binder on
the adhesion strength, the authors studied PVDF crystallinity in the

composite films using DSC. Samples with higher crystallinity show higher adhesion strength, independent of annealing temperature and casting solvent. The scratch adhesion was also measured for swollen electrodes immersed in 3:7 volume ratio of ethylene carbonate:ethyl Me carbonate (EC:EMC) at different temps. After being swollen, the composite films prepared from PVDF modified with hydroxyl functional groups show higher adhesion strengths than the others due to their low uptake of the electrolyte solvent.

IT 7440-50-8, Copper, uses

RL: DEV (Device component use); USES (Uses)
(current collector **substrate**; effect of poly(vinylidene fluoride) binder crystallinity and graphite structure on mech. strength of composite **anode** in **lithium ion battery**)

RN 7440-50-8 HCAPLUS

CN Copper (7CI, 8CI, 9CI) (CA INDEX NAME)

Cu

CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)
Section cross-reference(s): 38

ST poly vinylidene fluoride binder crystallinity graphite adhesive strength composite; **battery anode** carbon PVDF
adhesion XPS carbonate electrolyte swelling

IT Fluoropolymers, uses

RL: DEV (Device component use); PRP (Properties); USES (Uses)
(KF 1300, Kynar 301F MKB212A, composite with carbon, **anode**; effect of poly(vinylidene fluoride) binder crystallinity and graphite structure on mech. strength of composite **anode** in **lithium ion battery**)

IT Swelling, physical

(effect of OH⁻ functionality on; effect of poly(vinylidene fluoride) binder crystallinity and graphite structure on mech. strength of composite **anode** in **lithium ion battery**)

IT Annealing

Battery anodes

Composites

Crystal structure

X-ray photoelectron spectra

(effect of poly(vinylidene fluoride) binder crystallinity and graphite structure on mech. strength of composite **anode** in **lithium ion battery**)

IT Solvents

(effect on composite film casting; effect of poly(vinylidene fluoride) binder crystallinity and graphite structure on mech. strength of composite **anode** in **lithium ion battery**)

IT Hydroxyl group

(effect on solvent swelling and adhesion of composite films; effect of poly(vinylidene fluoride) binder crystallinity and graphite structure on mech. strength of composite **anode** in **lithium ion battery**)

IT Casting of polymeric materials

(film, solvent effect on; effect of poly(vinylidene fluoride) binder crystallinity and graphite structure on mech. strength of composite **anode** in **lithium ion**)

- battery)**
- IT Adhesion, physical
(interfacial, of composite film to copper, relationship to crystallinity and OH functionality of PVDF phase; effect of poly(vinylidene fluoride) binder crystallinity and graphite structure on mech. strength of composite **anode** in **lithium ion battery**)
- IT Surface **roughness**
(relationship to crystallinity of PVDF phase; surface **roughness** of composite films, normalized to carbon particle size)
- IT Crystallinity
(relationships of crystallinity of PVDF phase in composites to normalized surface **roughness** and adhesive strength to copper)
- IT 24937-79-9, PVDF
RL: DEV (Device component use); PRP (Properties); USES (Uses)
(KF 1300, Kynar 301F MKB212A, composite with carbon, **anode**; effect of poly(vinylidene fluoride) binder crystallinity and graphite structure on mech. strength of composite **anode** in **lithium ion battery**)
- IT 7440-44-0, Carbon, uses
RL: DEV (Device component use); PRP (Properties); USES (Uses)
(MBC-N, amorphous, composite with PVDF, **anode**; effect of poly(vinylidene fluoride) binder crystallinity and graphite structure on mech. strength of composite **anode** in **lithium ion battery**)
- IT 7782-42-5, Graphite, uses
RL: DEV (Device component use); PRP (Properties); USES (Uses)
(MPG-V2, MCMB, SFG75, SFG44, SFG15, KS15, KS6, composite with PVDF, **anode**; effect of poly(vinylidene fluoride) binder crystallinity and graphite structure on mech. strength of composite **anode** in **lithium ion battery**)
- IT 7440-50-8, Copper, uses
RL: DEV (Device component use); USES (Uses)
(current collector **substrate**; effect of poly(vinylidene fluoride) binder crystallinity and graphite structure on mech. strength of composite **anode** in **lithium ion battery**)
- IT 96-49-1, Ethylene carbonate 623-53-0, Ethyl methyl carbonate
RL: DEV (Device component use); USES (Uses)
(electrolyte; effect of poly(vinylidene fluoride) binder crystallinity and graphite structure on mech. strength of composite **anode** in **lithium ion battery**)

REFERENCE COUNT: 30 THERE ARE 30 CITED REFERENCES AVAILABLE
FOR THIS RECORD. ALL CITATIONS AVAILABLE
IN THE RE FORMAT

L113 ANSWER 13 OF 29 HCAPLUS COPYRIGHT 2006 ACS on STN

ACCESSION NUMBER: 2002:983187 HCAPLUS

DOCUMENT NUMBER: 138:323925

TITLE: Electrochemical studies of nanocrystalline
Mg₂Si thin film electrodes prepared by pulsed
laser deposition

AUTHOR(S): Song, Seung-Wan; Striebel, Kathryn A.; Reade,
Ronald P.; Roberts, Gregory A.; Cairns, Elton J.

CORPORATE SOURCE: Environmental Energy Technologies Division,

Ernest Orlando Lawrence Berkeley National
Laboratory, Berkeley, CA, 94720, USA

SOURCE: Journal of the Electrochemical Society (2003),
150(1), A121-A127
CODEN: JESOAN; ISSN: 0013-4651

PUBLISHER: Electrochemical Society

DOCUMENT TYPE: Journal

LANGUAGE: English

AB Electrochem. active thin films of Mg_2Si in various film thicknesses of 30-380 nm have been prepared with the pulsed laser deposition technique. The thinnest film of 30 nm showed a highly stable cycling behavior at 0.1-1.0 V vs. Li, delivering capacity greater than 2000 mAh/g for more than 100 cycles. Though the film morphol. became remarkably **rougher** with cycling, the films showed good stability. However, the first cycle irreversible capacity loss increased with film thickness. Therefore, lithium adsorption/desorption reaction forming Li-Si alloy at the Si-rich film surface is suggested as one of the sources of the large capacity of the 30 nm film. The superior capacity retention, when compared to porous electrodes of this alloy, may be attributed to a limited structural volume change in the two-dimensional film, shorter lithium diffusion path and enhanced conductivity from stainless steel **substrate**. The goals of this study are to promote the emerging need of thin film **anodes** for all solid-state microbatteries and clarify the capacity failure of powder intermetallic **anodes** for rechargeable **lithium batteries**.

CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)

ST magnesium silicide nanocryst **anode lithium battery**

IT Battery **anodes**
Nanocrystalline materials
(electrochem. studies of nanonocryst. Mg_2Si thin film electrodes for **lithium batteries** prepared by pulsed laser deposition)

IT Secondary **batteries**
(**lithium**; electrochem. studies of nanonocryst. Mg_2Si thin film electrodes for **lithium batteries** prepared by pulsed laser deposition)

IT Diffusion
Intercalation
(of lithium; electrochem. studies of nanonocryst. Mg_2Si thin film electrodes for **lithium batteries** prepared by pulsed laser deposition)

IT 7439-93-2, Lithium, properties
RL: PRP (Properties)
(absorption-desorption and diffusivity of of; electrochem. studies of nanonocryst. Mg_2Si thin film electrodes for **lithium batteries** prepared by pulsed laser deposition)

IT 22831-39-6, Magnesium silicide Mg_2Si
RL: DEV (Device component use); PEP (Physical, engineering or chemical process); PRP (Properties); PYP (Physical process); PROC (Process); USES (Uses)
(electrochem. studies of nanonocryst. Mg_2Si thin film electrodes for **lithium batteries** prepared by pulsed laser deposition)

IT 146296-28-8, Lithium magnesium silicide Li_2MgSi
RL: DEV (Device component use); PEP (Physical, engineering or chemical process); PRP (Properties); PYP (Physical process); PROC

(Process); USES (Uses)

(lithium absorption product; electrochem. studies of nanoncryst.
Mg₂Si thin film electrodes for lithium

batteries prepared by pulsed laser deposition)

REFERENCE COUNT: 40 THERE ARE 40 CITED REFERENCES AVAILABLE
FOR THIS RECORD. ALL CITATIONS AVAILABLE
IN THE RE FORMAT

L113 ANSWER 14 OF 29 HCAPLUS COPYRIGHT 2006 ACS on STN

ACCESSION NUMBER: 2002:447278 HCAPLUS

DOCUMENT NUMBER: 137:8657

TITLE: Manufacture of **anode** for secondary
lithium battery

INVENTOR(S): Okano, Hiroshi; Yagi, Hiromasa

PATENT ASSIGNEE(S): Sanyo Electric Co., Ltd., Japan

SOURCE: Jpn. Kokai Tokkyo Koho, 6 pp.

CODEN: JKXXAF

DOCUMENT TYPE: Patent

LANGUAGE: Japanese

FAMILY ACC. NUM. COUNT: 2

PATENT INFORMATION:

| PATENT NO. | KIND | DATE | APPLICATION NO. | DATE |
|------------------------|------|----------|-----------------|------------|
| JP 2002170554 | A2 | 20020614 | JP 2000-366876 | 20001201 |
| US 2002102348 | A1 | 20020801 | US 2001-995863 | 20011129 |
| US 6815003 | B2 | 20041109 | | |
| PRIORITY APPLN. INFO.: | | | JP. 2000-366876 | A 20001201 |
| | | | JP 2001-8692 | A 20010117 |

AB The **anode** is prepared by wet etching a metal foil to form a **rough** surface, and depositing a Li intercalating active mass layer on the **roughened** surface. The metal foil may be a Ni foil, and may have an intermediate Cu layer on the **roughened** surface; and the active mass is selected from amorphous and microcryst. Si, Ge, and Si-Ge alloy.

IT 7440-50-8, Copper, uses

RL: DEV (Device component use); USES (Uses)

(manufacture of silicon and germanium **anodes** with copper coated wet etched nickel **substrates** for secondary
lithium batteries)

RN 7440-50-8 HCAPLUS

CN Copper (7CI, 8CI, 9CI) (CA INDEX NAME)

Cu

IT 7440-02-0, Nickel, uses

RL: DEV (Device component use); PEP (Physical, engineering or

chemical process); PYP (Physical process); PROC (Process); USES (Uses)

(wet etching of metal foil **substrates** in silicon and germanium **anode** manufacture for secondary lithium **batteries**)

RN 7440-02-0 HCAPLUS

CN Nickel (8CI, 9CI) (CA INDEX NAME)

Ni

IC ICM H01M004-04

ICS H01M004-38; H01M004-66; H01M004-02; H01M010-40

CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)

ST secondary lithium battery anode manuf

substrate surface roughening; nickel

substrate surface roughening lithium

battery anode

IT **Battery anodes**

(manufacture of silicon and germanium **anodes** with copper coated wet etched nickel **substrates** for secondary lithium **batteries**)

IT 7440-21-3, Silicon, uses 7440-50-8, Copper, uses

7440-56-4, Germanium, uses 11148-21-3

RL: DEV (Device component use); USES (Uses)

(manufacture of silicon and germanium **anodes** with copper coated wet etched nickel **substrates** for secondary lithium **batteries**)

IT 7440-02-0, Nickel, uses

RL: DEV (Device component use); PEP (Physical, engineering or chemical process); PYP (Physical process); PROC (Process); USES (Uses)

(wet etching of metal foil **substrates** in silicon and germanium **anode** manufacture for secondary lithium **batteries**)

L113 ANSWER 15 OF 29 HCAPLUS COPYRIGHT 2006 ACS on STN

ACCESSION NUMBER: 2001:80332 HCAPLUS

DOCUMENT NUMBER: 134:225011

TITLE: Electrochemical and topographical characterization of optically smooth Zn films prepared by physical vapor deposition

AUTHOR(S): Luo, Yu; Yee, Nelson; Shi, Qingfang; Zhang, Baoxin; Mo, Yibo; Chottiner, Gary S.; Scherson, Daniel A.

CORPORATE SOURCE: Department of Chemistry, Case Western Reserve University, Cleveland, OH, 44106, USA

SOURCE: Proceedings - Electrochemical Society (2000), 2000-4 (Oxide Films), 399-402
CODEN: PESODO; ISSN: 0161-6374

PUBLISHER: Electrochemical Society

DOCUMENT TYPE: Journal

LANGUAGE: English

AB Optically smooth Zn films supported on Cu-coated glass and quartz **substrates** have been obtained by phys. vapor deposition of Zn in metallic form. The method employed involves resistive heating of a Mo boat filled with high purity Zn shot in an Ar atmospheric at pressures of about 3-5 mtorr. Atomic force microscopy images revealed that the resulting Zn deposits consist of highly

smooth features (rms roughness ca.0.3 nm) of dimensions on the order of 200 nm. Preliminary results indicate that the electrochem. behavior of these films in strongly alkaline solns. is somewhat different than that observed for Zn in bulk com. form.

IT 7440-50-8, Copper, uses

RL: DEV (Device component use); USES (Uses)

(glass **substrate** coated with; electrochem. and topog. characterization of optically smooth Zn films prepared by phys. vapor deposition)

RN 7440-50-8 HCAPLUS

CN Copper (7CI, 8CI, 9CI) (CA INDEX NAME)

Cu

CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)
Section cross-reference(s): 72

ST discharge **battery** zinc **anode** passivation; phys
vapor deposition zinc film; electrodissohn alk soln zinc film

IT **Battery anodes**

Passivation

(electrochem. and topog. characterization of optically smooth Zn films prepared by phys. vapor deposition)

IT 7440-50-8, Copper, uses

RL: DEV (Device component use); USES (Uses)

(glass **substrate** coated with; electrochem. and topog. characterization of optically smooth Zn films prepared by phys. vapor deposition)

IT 14808-60-7, Quartz, uses

RL: DEV (Device component use); USES (Uses)

(**substrate**; electrochem. and topog. characterization of optically smooth Zn films prepared by phys. vapor deposition)

REFERENCE COUNT: 4 THERE ARE 4 CITED REFERENCES AVAILABLE FOR
THIS RECORD. ALL CITATIONS AVAILABLE IN
THE RE FORMAT

L113 ANSWER 16 OF 29 HCAPLUS COPYRIGHT 2006 ACS on STN

ACCESSION NUMBER: 2000:844141 HCAPLUS

DOCUMENT NUMBER: 133:352611

TITLE: Manufacture of foamed Ni with **roughened**
surface for **battery**

INVENTOR(S): Zhong, Faping

PATENT ASSIGNEE(S): Peop. Rep. China

SOURCE: Faming Zhuanli Shenqing Gongkai Shuomingshu, 8
pp.
CODEN: CNXXEV

DOCUMENT TYPE: Patent

LANGUAGE: Chinese

FAMILY ACC. NUM. COUNT: 1

PATENT INFORMATION:

| PATENT NO. | KIND | DATE | APPLICATION NO. | DATE |
|------------------------|------|----------|-----------------|--------------|
| ----- | ---- | ----- | ----- | |
| CN 1249541 | A | 20000405 | CN 1999-115542 | 199908 27 |
| CN 1116706 | B | 20030730 | | |
| PRIORITY APPLN. INFO.: | | | CN 1999-115542 | |

199908
27

AB The foamed **Ni** is manufactured by spray-coating adhesive material onto the surface of conventional foamed **Ni substrate**, treating by conventional elec. conducting treatment, electrodepositing, and heat treatment. The foamed **Ni** may also be manufactured by coating adhesive material onto the **substrate** during electrodeposition, treating by **anodic** dissoln. in Watt electroplating bath or **Ni** aminosulfonate solution at 10-5000 A/m², and heat treatment. The adhesive material is organic material, inorg. material, or solid powders with high adhesion with the **substrate**, epoxy paints, alkyd **resin** paints, **acrylic resin** paints, polyurethane paints, and **ethylene resin** paints. The foamed **Ni** is used in secondary **batteries**. Foamed **Cu**, foamed **Fe**, and foamed **Zn** may also be manufactured by the method.

IC ICM H01M004-00
ICS C25D005-02; C25F003-14

CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)

ST foamed nickel **roughening** secondary **battery**

IT Paints
(adhesive material containing; in manufacture of foamed **Ni** with **roughened** surface for **battery**)

IT Adhesives
(in manufacture of foamed **Ni** with **roughened** surface for **battery**)

IT Electrodeposition
Secondary **batteries**
Surface **roughness**
(manufacture of foamed **Ni** with **roughened** surface for **battery**)

IT Coating process
(spray; in manufacture of foamed **Ni** with **roughened** surface for **battery**)

IT 7440-02-0, Nickel, uses
RL: DEV (Device component use); PEP (Physical, engineering or chemical process); PROC (Process); USES (Uses)
(manufacture of foamed **Ni** with **roughened** surface for **battery**)

L113 ANSWER 17 OF 29 HCAPLUS COPYRIGHT 2006 ACS on STN

ACCESSION NUMBER: 1998:337786 HCAPLUS

DOCUMENT NUMBER: 129:56464

TITLE: Surface transformations of **polypropylene**-graphite composite electrode material during intercalation/de-intercalation of monovalent cationic and anionic species from non-aqueous solvents

AUTHOR(S): Santhanam, R.; Kamaraj, P.; Noel, M.

CORPORATE SOURCE: Central Electrochemical Research Institute, Karaikudi, 630 006, India

SOURCE: Journal of Power Sources (1998), 72(2), 239-243
CODEN: JPSODZ; ISSN: 0378-7753

PUBLISHER: Elsevier Science S.A.

DOCUMENT TYPE: Journal

LANGUAGE: English

AB Surface transformations of a **polypropylene**-graphite composite electrode after intercalation/de-intercalation of

monovalent cationic (Li⁺, Na⁺, K⁺ and TBA⁺) and anionic (ClO₄⁻ and BF₄⁻) species in different non-aqueous solvents are compared under otherwise identical exptl. conditions using SEM. Li⁺ and TBA⁺ cations, as well as the BF₄⁻ anion, display fairly high intercalation/de-intercalation efficiency and a high level of surface **roughening** due to the removal of horizontally-oriented graphite plates in the initial phases of cycling. Edge planes are found to be responsible for the highly reversible intercalation/de-intercalation behavior and the cycleability.

IT 9003-07-0, **Polypropylene**

RL: DEV (Device component use); PRP (Properties); USES (Uses)
(surface transformation of **polypropylene**-graphite
electrode during intercalation of ions from non-aqueous solvents)

RN 9003-07-0 HCAPLUS

CN 1-Propene, homopolymer (9CI) (CA INDEX NAME)

CM 1

CRN 115-07-1

CMF C3 H6



IT 7439-93-2, Lithium, reactions

RL: PEP (Physical, engineering or chemical process); RCT (Reactant);
PROC (Process); RACT (Reactant or reagent)
(surface transformation of **polypropylene**-graphite
electrode during intercalation of ions from non-aqueous solvents)

RN 7439-93-2 HCAPLUS

CN Lithium (7CI, 8CI, 9CI) (CA INDEX NAME)

Li

CC 52-2 (**Electrochemical**, Radiational, and Thermal Energy
Technology)

Section cross-reference(s): 35

ST electrode intercalation surface transformation nonaq solvent;
graphite **polypropylene** electrode intercalation nonaq
solvent

IT Battery **anodes**

Battery electrodes

Intercalation

Surface **roughness**

(surface transformation of **polypropylene**-graphite
electrode during intercalation of ions from non-aqueous solvents)

IT 7782-42-5, Graphite, uses 9003-07-0, **Polypropylene**

RL: DEV (Device component use); PRP (Properties); USES (Uses)

(surface transformation of **polypropylene**-graphite
electrode during intercalation of ions from non-aqueous solvents)

IT 67-68-5, Dimethylsulfoxide, uses 68-12-2, Dimethylformamide, uses
75-05-8, Acetonitrile, uses 108-32-7, Propylene carbonate

RL: NUU (Other use, unclassified); USES (Uses)

(surface transformation of **polypropylene**-graphite
electrode during intercalation of ions from non-aqueous solvents)

IT 429-42-5, Tetrabutyl ammonium fluoborate 1923-70-2,

Tetrabutylammonium perchlorate 7439-93-2, Lithium, reactions 7440-09-7, Potassium, reactions 7440-23-5, Sodium, reactions 7601-89-0, Sodium perchlorate 7778-74-7, Potassium perchlorate 7791-03-9, Lithium perchlorate 10549-76-5, Tetrabutylammonium 14797-73-0, Perchlorate 14874-70-5, Tetrafluoroborate

RL: PEP (Physical, engineering or chemical process); RCT (Reactant); PROC (Process); RACT (Reactant or reagent)

(surface transformation of **polypropylene**-graphite electrode during intercalation of ions from non-aqueous solvents)

REFERENCE COUNT: 11 THERE ARE 11 CITED REFERENCES AVAILABLE FOR THIS RECORD. ALL CITATIONS AVAILABLE IN THE RE FORMAT

L113 ANSWER 18 OF 29 HCAPLUS COPYRIGHT 2006 ACS on STN

ACCESSION NUMBER: 1997:116273 HCAPLUS

DOCUMENT NUMBER: 126:120034

TITLE: Secondary lithium batteries and their electrodes having improved aluminum current collectors

INVENTOR(S): Katagiri, Nobuo; Hayashi, Yoshitaka; Kurosawa, Yoshiko; Fujii, Toshishige; Kahata, Toshuki; Kimura, Okitoshi; Iechi, Hiroyuki; Oosawa, Toshuki

PATENT ASSIGNEE(S): Ricoh Kk, Japan

SOURCE: Jpn. Kokai Tokkyo Koho, 7 pp.

CODEN: JKXXAF

DOCUMENT TYPE: Patent

LANGUAGE: Japanese

FAMILY ACC. NUM. COUNT: 1

PATENT INFORMATION:

| PATENT NO. | KIND | DATE | APPLICATION NO. | DATE |
|------------------------|------|----------|-----------------|----------------|
| JP 08298137 | A2 | 19961112 | JP 1995-126026 | 19950426 |
| PRIORITY APPLN. INFO.: | | | | JP 1995-126026 |
| | | | | 19950426 |

AB The electrodes contain active mass layers and Al foils as current collectors having capacitance with surface roughness $\geq 50 \mu\text{F}/\text{cm}^2$. Preferably, the active mass layers are prepared by uniform dispersion of granular inorg. active mass in electrochem. oxidation-reduction electroconductive polymer matrixes. The batteries have electrolytes containing $\text{LiN}(\text{CF}_3\text{SO}_2)_2$ and optionally LiBF_4 , LiAsF_6 , and/or LiPF_6 . Preferably, the electrolytes are polymer solid electrolytes containing carbonates in crosslinked polymers as matrixes. The batteries have high performance.

IT 7439-93-2, Lithium, uses
RL: DEV (Device component use); USES (Uses)
(battery anodes)

RN 7439-93-2 HCAPLUS

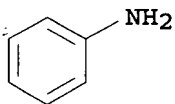
CN Lithium (7CI, 8CI, 9CI) (CA INDEX NAME)

Li

IT 25233-30-1, Polyaniline
 RL: DEV (Device component use); USES (Uses)
 (battery cathodes containing)
 RN 25233-30-1 HCAPLUS
 CN Benzenamine, homopolymer (9CI) (CA INDEX NAME)

CM 1

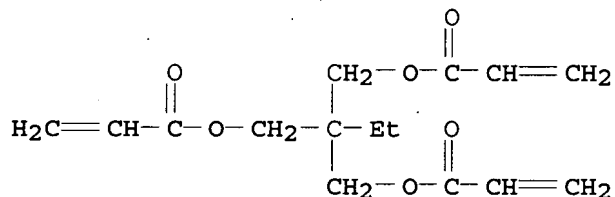
CRN 62-53-3
 CMF C6 H7 N



IT 86469-77-4P
 RL: DEV (Device component use); IMF (Industrial manufacture); PREP
 (Preparation); USES (Uses)
 (battery electrolytes containing)
 RN 86469-77-4 HCAPLUS
 CN 2-Propenoic acid, 2-(2-ethoxyethoxy)ethyl ester, polymer with
 2-ethyl-2-[[[(1-oxo-2-propenyl)oxy]methyl]-1,3-propanediyl
 di-2-propenoate (9CI) (CA INDEX NAME)

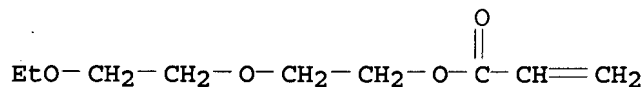
CM 1

CRN 15625-89-5
 CMF C15 H20 O6



CM 2

CRN 7328-17-8
 CMF C9 H16 O4



IC ICM H01M010-40
 ICS H01M010-40; H01M004-02; H01M004-64
 CC 52-2 (Electrochemical, Radiational, and Thermal Energy
 Technology)
 IT 7439-93-2, Lithium, uses
 RL: DEV (Device component use); USES (Uses)

(battery **anodes**)

IT 1313-13-9, Manganese dioxide, uses 1314-62-1, Vanadium oxide (V2O5), uses 12190-79-3, Cobalt lithium oxide (LiCoO2) 25233-30-1, Polyaniline

RL: DEV (Device component use); USES (Uses)
(battery cathodes containing)

IT 86469-77-4P

RL: DEV (Device component use); IMF (Industrial manufacture); PREP (Preparation); USES (Uses)
(battery electrolytes containing)

L113 ANSWER 19 OF 29 HCAPLUS COPYRIGHT 2006 ACS on STN

ACCESSION NUMBER: 1996:641254 HCAPLUS

DOCUMENT NUMBER: 125:280690

TITLE: Secondary nonaqueous electrolyte **batteries** using carbonaceous **anodes**

INVENTOR(S): Endo, Masanori

PATENT ASSIGNEE(S): Murata Manufacturing Co, Japan

SOURCE: Jpn. Kokai Tokkyo Koho, 5 pp.

CODEN: JKXXAF

DOCUMENT TYPE: Patent

LANGUAGE: Japanese

FAMILY ACC. NUM. COUNT: 1

PATENT INFORMATION:

| PATENT NO. | KIND | DATE | APPLICATION NO. | DATE |
|------------------------|------|----------|-----------------|---------------|
| ----- | ---- | ----- | ----- | |
| JP 08213050 | A2 | 19960820 | JP 1995-21805 | 19950209 |
| PRIORITY APPLN. INFO.: | | | | JP 1995-21805 |
| | | | | 19950209 |

AB The **batteries** use Li containing oxide cathodes and **anodes** having a carbonaceous material layer applied on an electrolytic metal foil **substrate**. The foil may be Cu or Ni, have max surface **roughness** $\geq 3 \mu\text{m}$, and coated with an organic compound

IT 7440-02-0, Nickel, uses 7440-50-8, Copper, uses
RL: DEV (Device component use); PEP (Physical, engineering or chemical process); PROC (Process); USES (Uses)
(carbonaceous **anodes** with electrolytic copper or nickel foil **substrates** for secondary lithium **batteries**)

RN 7440-02-0 HCAPLUS

CN Nickel (8CI, 9CI) (CA INDEX NAME)

Ni

RN 7440-50-8 HCAPLUS

CN Copper (7CI, 8CI, 9CI) (CA INDEX NAME)

Cu

IC ICM H01M010-40
ICS H01M004-02; H01M004-64; H01M004-66
CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)
ST **battery carbonaceous anode copper foil substrate; nickel substrate surface roughness carbonaceous anode**
IT Carbonaceous materials
RL: DEV (Device component use); PEP (Physical, engineering or chemical process); PROC (Process); USES (Uses)
(carbonaceous **anodes** with electrolytic copper or nickel foil **substrates** for secondary lithium **batteries**)
IT **Anodes**
(**battery**, carbonaceous **anodes** with electrolytic copper or nickel foil **substrates** for secondary lithium **batteries**)
IT 124-22-1, Dodecylamine
RL: MOA (Modifier or additive use); USES (Uses)
(carbonaceous **anodes** with dodecylamine coated electrolytic copper or nickel foil **substrates** for secondary lithium **batteries**)
IT 7440-02-0, Nickel, uses 7440-50-8, Copper, uses
RL: DEV (Device component use); PEP (Physical, engineering or chemical process); PROC (Process); USES (Uses)
(carbonaceous **anodes** with electrolytic copper or nickel foil **substrates** for secondary lithium **batteries**)
IT 7782-42-5, Graphite, uses
RL: DEV (Device component use); PEP (Physical, engineering or chemical process); PROC (Process); USES (Uses)
(graphite **anodes** with electrolytic copper or nickel foil **substrates** for secondary lithium **batteries**)

L113 ANSWER 20 OF 29 HCAPLUS COPYRIGHT 2006 ACS on STN
ACCESSION NUMBER: 1996:628482 HCAPLUS
DOCUMENT NUMBER: 125:252983
TITLE: Secondary lithium batteries
using electrodes having controlled surface
roughness
INVENTOR(S): Akaha, Naoto; Kawakami, Akira
PATENT ASSIGNEE(S): Hitachi Maxell, Japan
SOURCE: Jpn. Kokai Tokkyo Koho, 7 pp.
CODEN: JKXXAF
DOCUMENT TYPE: Patent
LANGUAGE: Japanese
FAMILY ACC. NUM. COUNT: 1
PATENT INFORMATION:

| PATENT NO. | KIND | DATE | APPLICATION NO. | DATE |
|------------------------|------|----------|-----------------|----------|
| JP 08203501 | A2 | 19960809 | JP 1995-30083 | 19950125 |
| PRIORITY APPLN. INFO.: | | | | 19950125 |
| | | | | 19950125 |

AB The batteries use electrodes having a layer of a mixture containing a Li containing multiple oxide or a Li intercalating material and a binder applied on a conductive **substrate** and having maximum surface **roughness** 0.5-2 μm .

IC ICM H01M004-02
ICS H01M004-64; H01M010-40

CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)

ST **lithium battery** electrode surface **roughness**

IT Electrodes
(battery, controlled surface **roughness** of electrodes for secondary **lithium batteries**)

IT Surface structure
(**roughness**, controlled surface **roughness** of electrodes for secondary **lithium batteries**)

IT 7440-50-8, Copper, uses 7782-42-5, Graphite, uses
RL: DEV (Device component use); PEP (Physical, engineering or chemical process); PRP (Properties); PROC (Process); USES (Uses)
(controlled surface **roughness** of graphite **anodes** with copper supports for **lithium batteries**)

IT 7429-90-5, Aluminum, uses 12031-65-1, Lithium nickel oxide (LiNiO₂)
RL: DEV (Device component use); PEP (Physical, engineering or chemical process); PRP (Properties); PROC (Process); USES (Uses)
(controlled surface **roughness** of lithium nickel oxide cathodes with aluminum supports for batteries)

L113 ANSWER 21 OF 29 HCAPLUS COPYRIGHT 2006 ACS on STN

ACCESSION NUMBER: 1996:259661 HCAPLUS

DOCUMENT NUMBER: 124:294555

TITLE: **Lithium battery**

anodes and their manufacture

INVENTOR(S): Mizuno, Fumiaki; Hanabusa, Koji; Myai, Kyoshi; Tada, Toshiharu

PATENT ASSIGNEE(S): Sumitomo Electric Industries, Japan; Kansai Electric Power Co

SOURCE: Jpn. Kokai Tokkyo Koho, 9 pp.

CODEN: JKXXAF

DOCUMENT TYPE: Patent

LANGUAGE: Japanese

FAMILY ACC. NUM. COUNT: 1

PATENT INFORMATION:

| PATENT NO. | KIND | DATE | APPLICATION NO. | DATE |
|---------------------------------------|------|----------|-----------------|----------|
| ----- | ---- | ----- | ----- | |
| JP 08064201 | A2 | 19960308 | JP 1994-198288 | 19940823 |
| PRIORITY APPLN. INFO.: JP 1994-198288 | | | | 19940823 |

AB The **anodes** have carbon fibers pressed/on a metal foil, where the foil has a max **roughness** $\geq 3 \mu\text{m}$ and average **roughness** $\geq 0.2 \mu\text{m}$ at the surface contacting the carbon fibers. The **anodes** are prepared by **roughening** the metal foil to the required **roughness** at least at 1 side and pressing carbon fibers on the

roughened surface.

IT 7439-93-2, Lithium, uses
 RL: DEV (Device component use); USES (Uses)
 (structure and manufacture of lithium intercalating carbon fiber
 anodes with surface roughened metal foil
 substrates for batteries)
 RN 7439-93-2 HCAPLUS
 CN Lithium (7CI, 8CI, 9CI) (CA INDEX NAME)

Li

IT 7440-02-0, Nickel, uses 7440-50-8, Copper, uses
 RL: DEV (Device component use); PEP (Physical, engineering or
 chemical process); PRP (Properties); PROC (Process); USES (Uses)
 (structure and manufacture of surface roughened metal foil
 substrates for carbon fiber anodes for
 lithium batteries)
 RN 7440-02-0 HCAPLUS
 CN Nickel (8CI, 9CI) (CA INDEX NAME)

Ni

RN 7440-50-8 HCAPLUS
 CN Copper (7CI, 8CI, 9CI) (CA INDEX NAME)

Cu

IC ICM H01M004-02
 ICS H01M004-04; H01M004-58; H01M004-64
 CC 52-2 (Electrochemical, Radiational, and Thermal Energy
 Technology)
 ST battery lithium carbon fiber anode;
 lithium anode carbon fiber metal substrate
 IT Carbon fibers, uses
 RL: DEV (Device component use); USES (Uses)
 (structure and manufacture of surface roughened metal foil
 substrates for carbon fiber anodes for
 lithium batteries)
 IT Anodes
 (battery, structure and manufacture of surface
 roughened metal foil substrates for carbon
 fiber anodes for lithium batteries)
 IT 7439-93-2, Lithium, uses
 RL: DEV (Device component use); USES (Uses)
 (structure and manufacture of lithium intercalating carbon fiber
 anodes with surface roughened metal foil
 substrates for batteries)
 IT 7440-02-0, Nickel, uses 7440-50-8, Copper, uses
 RL: DEV (Device component use); PEP (Physical, engineering or
 chemical process); PRP (Properties); PROC (Process); USES (Uses)
 (structure and manufacture of surface roughened metal foil
 substrates for carbon fiber anodes for
 lithium batteries)

L113 ANSWER 22 OF 29 HCAPLUS COPYRIGHT 2006 ACS on STN

ACCESSION NUMBER: 1994:17676 HCAPLUS

DOCUMENT NUMBER: 120:17676

TITLE: In situ observation and evaluation of
electrodeposited lithium by means of optical
microscopy with alternating current impedance
spectroscopyAUTHOR(S): Osaka, Tetsuya; Momma, Toshiyuki; Nishimura,
Ken; Tajima, Takayuki

CORPORATE SOURCE: Sch. Sci. Eng., Waseda Univ., Tokyo, 169, Japan

SOURCE: Journal of the Electrochemical Society (1993),
140(10), 2745-8

CODEN: JESOAN; ISSN: 0013-4651

DOCUMENT TYPE: Journal

LANGUAGE: English

AB Electrodeposited Li was evaluated by a.c. impedance measurement and optical microscopy in 2 solns. containing LiClO₄; a propylene carbonate (PC) solution and a blended solution consisting of PC and 1,2-dimethoxyethane (DME) (volume ratio = 1:1). The a.c. impedance data were analyzed in the higher frequency region, where the charge-transfer resistance (R_{ct}) of Li⁺ + e⁻ .dclarw. Li can be evaluated. The value of R_{ct} was always larger in the PC electrolyte solution than in the PC-DME(1:1) electrolyte solution, and R_{ct} depended on the Li deposition charge. Microscopic observation indicated that Li deposited more uniformly in PC-DME (1:1) than in PC solution. The results of morphol. evaluation of the electrodeposited Li using optical microscopy corresponded to the variations in the value of R_{ct} obtained from a.c. impedance measurements, showing that the behavior of R_{ct} accurately represented the morphol. state. The cycleability of the Li **anode** was studied by charge-discharge testing. The cycle efficiency was worse in PC than in PC-DME (1:1) solution; this seems to be related to the morphol. properties of the Li deposits.

IT 7439-93-2, Lithium, uses

RL: USES (Uses)

(electrodeposition and cycling ability of, in propylene carbonate with and without dimethoxyethane, elec. impedance in study of)

RN 7439-93-2 HCAPLUS

CN Lithium (7CI, 8CI, 9CI) (CA INDEX NAME)

Li

IT 7440-02-0, Nickel, uses

RL: USES (Uses)

(electrodeposition of lithium on **substrate** of, in propylene carbonate with and without dimethoxyethane)

RN 7440-02-0 HCAPLUS

CN Nickel (8CI, 9CI) (CA INDEX NAME)

Ni

CC 72-8 (Electrochemistry)

Section cross-reference(s): 52, 66

ST lithium electrodeposition elec impedance; **anode** lithium cycling efficiency; **roughness** surface structure lithium electrodeposit

IT **Anodes**
(lithium electrodeposits, cycling ability of)
IT Surface structure
(**roughness**, of lithium electrodeposits from propylene carbonate-based solvent)
IT **7439-93-2**, Lithium, uses
RL: USES (Uses)
(electrodeposition and cycling ability of, in propylene carbonate with and without dimethoxyethane, elec. impedance in study of)
IT **7440-02-0**, Nickel, uses
RL: USES (Uses)
(electrodeposition of lithium on **substrate** of, in propylene carbonate with and without dimethoxyethane)

L113 ANSWER 23 OF 29 HCAPLUS COPYRIGHT 2006 ACS on STN

ACCESSION NUMBER: 1993:9395 HCAPLUS

DOCUMENT NUMBER: 118:9395

TITLE: Connecting of electric leads to battery electrode current collectors

INVENTOR(S): Hanabusa, Koji; Hamamatsu, Hiromitsu

PATENT ASSIGNEE(S): Sumitomo Electric Industries, Ltd., Japan

SOURCE: Jpn. Kokai Tokkyo Koho, 3 pp.

CODEN: JKXXAF

DOCUMENT TYPE: Patent

LANGUAGE: Japanese

FAMILY ACC. NUM. COUNT: 1

PATENT INFORMATION:

| PATENT NO. | KIND | DATE | APPLICATION NO. | DATE |
|-------------|------|----------|-----------------|----------|
| ----- | ---- | ----- | ----- | |
| JP 04249863 | A2 | 19920904 | JP 1991-417 | 19910108 |
| | | | | 19910108 |

PRIORITY APPLN. INFO.: JP 1991-417

AB To connect elec. leads to current collectors having **rough** surfaces, a foil of a soft metal is wrapped around the joining end of the leads, and the leads are press bonded to the collectors via the foil. Pb foils were used for connecting elec. leads to polyaniline cathodes in Li batteries.

IT **7439-93-2**, Lithium, uses
RL: USES (Uses)
(**anodes**, joining of elec. leads from lead foils to current collectors of, in lithium batteries)

RN 7439-93-2 HCAPLUS

CN Lithium (7CI, 8CI, 9CI) (CA INDEX NAME)

Li

IT **25233-30-1**, Polyaniline
RL: USES (Uses)
(cathodes, joining of elec. leads from lead foils to current collectors of, in lithium batteries)

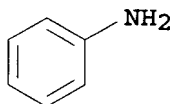
RN 25233-30-1 HCAPLUS

CN Benzenamine, homopolymer (9CI) (CA INDEX NAME)

CM 1

CRN 62-53-3

CMF C6 H7 N



IC ICM H01M004-74
ICS H01M002-26
CC 52-2 (**Electrochemical**, Radiational, and Thermal Energy Technology)
IT **Anodes**
(battery, lithium, joining of elec. leads from lead foils to current collectors of)
IT 7439-93-2, Lithium, uses
RL: USES (Uses)
(**anodes**, joining of elec. leads from lead foils to current collectors of, in lithium batteries)
IT 25233-30-1, Polyaniline
RL: USES (Uses)
(cathodes, joining of elec. leads from lead foils to current collectors of, in lithium batteries)

L113 ANSWER 24 OF 29 HCAPLUS COPYRIGHT 2006 ACS on STN
ACCESSION NUMBER: 1991:85348 HCAPLUS
DOCUMENT NUMBER: 114:85348
TITLE: Laminar lithium **anodes** for batteries
INVENTOR(S): Kahata, Toshiyuki; Osawa, Toshiyuki; Kimura, Okitoshi; Ujiie, Koji
PATENT ASSIGNEE(S): Ricoh Co., Ltd., Japan
SOURCE: Jpn. Kokai Tokkyo Koho, 5 pp.
CODEN: JKXXAF
DOCUMENT TYPE: Patent
LANGUAGE: Japanese
FAMILY ACC. NUM. COUNT: 1
PATENT INFORMATION:

| PATENT NO. | KIND | DATE | APPLICATION NO. | DATE |
|-------------|------|----------|-----------------|----------|
| JP 02129852 | A2 | 19900517 | JP 1988-282375 | 19881110 |
| JP 2729065 | B2 | 19980318 | JP 1988-282375 | 19881110 |

PRIORITY APPLN. INFO.: JP 1988-282375

AB The **anodes** are laminates of a Li or Li alloy and a current collector with an insulation film covering the exposed surface of the collector. Thus, Ni foils were coated with a **polyester** on 1 side, the other side was **roughened** with carborundum and pressed to a Li foil to obtain **anodes**. These **anodes** had high energy d. and current efficiency for use in

secondary Ni batteries.
 IT 7439-93-2, Lithium, uses and miscellaneous
 RL: USES (Uses)
 (anodes, with nickel collector foils with
 polyester coatings, for batteries)
 RN 7439-93-2 HCAPLUS
 CN Lithium (7CI, 8CI, 9CI) (CA INDEX NAME)

Li

IC ICM H01M004-02
 CC 52-2 (Electrochemical, Radiational, and Thermal Energy
 Technology)
 ST lithium battery anode nickel collector; polyester
 insulation lithium anode coating
 IT Anodes
 (battery, lithium, with nickel collector foils with
 polyester coatings)
 IT 7440-02-0, Nickel, uses and miscellaneous
 RL: USES (Uses)
 (anode collectors, with polyester coatings,
 for lithium batteries)
 IT 7439-93-2, Lithium, uses and miscellaneous
 RL: USES (Uses)
 (anodes, with nickel collector foils with
 polyester coatings, for batteries)

L113 ANSWER 25 OF 29 HCAPLUS COPYRIGHT 2006 ACS on STN
 ACCESSION NUMBER: 1991:9642 HCAPLUS
 DOCUMENT NUMBER: 114:9642
 TITLE: Solid-state alkali metal batteries
 having porous cathode current collectors
 INVENTOR(S): Fauteux, Denis G.; Moore, Michael J.; Blonsky,
 Peter M.
 PATENT ASSIGNEE(S): USA
 SOURCE: U.S., 7 pp.
 CODEN: USXXAM
 DOCUMENT TYPE: Patent
 LANGUAGE: English
 FAMILY ACC. NUM. COUNT: 1
 PATENT INFORMATION:

| PATENT NO. | KIND | DATE | APPLICATION NO. | DATE |
|-------------|------|----------|-----------------|--------------|
| ----- | ---- | ----- | ----- | |
| US 4925752 | A | 19900515 | US 1989-319434 | 198903 03 |
| CA 2009465 | AA | 19900903 | CA 1990-2009465 | 199002 07 |
| CA 2009465 | C | 19991102 | | |
| JP 02291673 | A2 | 19901203 | JP 1990-50808 | 199003 01 |
| JP 2914701 | B2 | 19990705 | | |
| EP 385802 | A1 | 19900905 | EP 1990-302257 | 199003 |

EP 385802 B1 19960207
 R: BE, DE, ES, FR, GB, IT, NL
 ES 2084655 T3 19960516 ES 1990-302257

02

199003

02

PRIORITY APPLN. INFO.:

US 1989-319434

A

198903

03

AB A laminar **battery** comprises an alkali metal **anode** (Li foil, a metal foil coated with a layer of Li or Li alloy), a solid ionically conducting electrolyte layer, and a cathode/current collector layer, which consists of an elec. conductive **substrate** having a plurality of surface voids and a radiation-cured cathode composition. The composition comprises a compound such as V6O13, MoO2, TiS2, FeOCl; an elec. conductive filler (C particles); and a radiation-cured ionically conductive electrolyte. The electrolyte comprises a solid solution of an ionizable alkali metal or alkaline earth salt and an ionically **conductive polymer** containing a repeating unit CH2C(H)(R)O, CHCH2NR1, or CH2CH(OR3R2), where R is H, R2, CH2OR2, CH2OR3R2, CH2NMe2; R1 is R2 or R3R2, R2 is C1-16 (preferably C1-4) alkyl or C5-8 cycloalkyl group and R3 is an ether group. The conductive **substrate** is C, Cu, Al, Ni, steel, and/or Pb. The importance of **roughened** surface of the conductive **substrate** (etched Ni foil, Ni felt) on the Li **battery** performance was demonstrated. The **battery** cathode mixture consisted of V6O13 45, C 4, and electrolyte 51%. The electrolyte consisted of propylene carbonate 70, PEO 3, LiCF3SO3 6, and radiation-curable acrylate 21%.

IT 7439-93-2D, Lithium, PEO complexes
 RL: USES (Uses)
 (electrolytes from propylene carbonate and radiation-curable acrylate and, for **batteries**)

RN 7439-93-2 HCAPLUS

CN Lithium (7CI, 8CI, 9CI) (CA INDEX NAME)

Li

IC ICM H01M006-18

INCL 429191000

CC 52-2 (**Electrochemical**, Radiational, and Thermal Energy Technology)

Section cross-reference(s): 38

ST **lithium** vanadium oxide **battery**; cathode etched nickel current collector; solid electrolyte **lithium** vanadium **battery**

IT **Acrylic polymers**, uses and miscellaneous

RL: USES (Uses)

(electrolytes from lithium-PEO complexes and propylene carbonate and, for **batteries**)

IT Cathodes

(**battery**, vanadium oxide, containing lithium trifluoromethanesulfonate and **conductive polymer**, with etched nickel current collector)

IT 7429-90-5, Aluminum, uses and miscellaneous 7439-92-1, Lead, uses and miscellaneous 7440-02-0, Nickel, uses and miscellaneous

7440-44-0, Carbon, uses and miscellaneous 7440-50-8, Copper, uses and miscellaneous 12597-69-2, Steel, uses and miscellaneous
 RL: USES (Uses)

(cathode collector, surface etched, for batteries)

IT 1307-96-6, Cobalt oxide (CoO), uses and miscellaneous 1313-13-9, Manganese dioxide, uses and miscellaneous 1314-62-1, Vanadium oxide (V2O5), uses and miscellaneous 1317-37-9, Iron sulfide (FeS) 1317-38-0, Copper oxide (CuO), uses and miscellaneous 11126-15-1, Lithium vanadium oxide 12018-01-8, Chromium oxide (CrO2) 12033-29-3, Molybdenum sulfide (MoS3) 12034-77-4, Niobium diselenide 12039-13-3, Titanium disulfide 12137-52-9, Vanadium oxide (V3O8) 12166-28-8, Vanadium disulfide 13870-10-5, Iron chloride oxide (FeClO) 15915-20-5, Chromium oxybromide (CrOBr) 16812-54-7, Nickel sulfide (NiS) 18868-43-4, Molybdenum oxide (MoO2)

RL: USES (Uses)

(cathodes, containing alkali metal or alkaline earth salt and conductive polymer, current collectors for, in batteries)

IT 12037-42-2, Vanadium oxide (V6O13)

RL: USES (Uses)

(cathodes, containing lithium trifluoromethanesulfonate, current collectors for, in batteries)

IT 108-32-7, Propylene carbonate

RL: USES (Uses)

(electrolytes from lithium-PEO complexes and radiation-curable acrylate and, for batteries)

IT 7439-93-2D, Lithium, PEO complexes 25322-68-3D, PEO, lithium complexes

RL: USES (Uses)

(electrolytes from propylene carbonate and radiation-curable acrylate and, for batteries)

L113 ANSWER 26 OF 29 HCAPLUS COPYRIGHT 2006 ACS on STN

ACCESSION NUMBER: 1989:216314 HCAPLUS

DOCUMENT NUMBER: 110:216314

TITLE: Laminar electrode, manufacture of the electrode and secondary battery using the electrode

INVENTOR(S): Ohsawa, Toshiyuki; Kabata, Toshiyuki; Kimura, Okitoshi; Yoneyama, Sachiko

PATENT ASSIGNEE(S): Ricoh Co., Ltd., Japan

SOURCE: Ger. Offen., 25 pp.

CODEN: GWXXBX

DOCUMENT TYPE: Patent

LANGUAGE: German

FAMILY ACC. NUM. COUNT: 3

PATENT INFORMATION:

| PATENT NO. | KIND | DATE | APPLICATION NO. | DATE |
|------------------------|------|----------|-----------------|----------|
| ----- | ---- | ----- | ----- | |
| DE 3829541 | A1 | 19890316 | DE 1988-3829541 | 19880831 |
| DE 3829541 | C2 | 19930408 | | |
| JP 02168560 | A2 | 19900628 | JP 1988-152227 | 19880622 |
| JP 2725786 | B2 | 19980311 | | |
| PRIORITY APPLN. INFO.: | | | JP 1987-219056 | A |

| | | |
|----------------|----|--------------|
| | | 198709 03 |
| JP 1987-242517 | A | 198709 29 |
| JP 1987-248093 | A | 198710 02 |
| JP 1987-252520 | A | 198710 08 |
| JP 1987-282134 | A | 198711 10 |
| JP 1987-283095 | A | 198711 11 |
| JP 1988-152227 | A | 198806 22 |
| JP 1987-168280 | A1 | 198707 06 |
| JP 1987-252519 | A1 | 198710 08 |
| JP 1988-53829 | A1 | 198803 09 |

AB The title electrode includes an Al collector, an active mass of PhNH₂-type polymer, and an optional elec. **conductive polymer** cover. The electrode is prepared by electropolymerization of PhNH₂ or an PhNH₂ derivative in presence of an acid (pKa = -2.5 to 2.5). The electropolymerization can be continued in the presence of HBF₄. A secondary battery comprises an **anode**, a solid electrolyte, and a cathode of the above composite electrode structure. Several composite polyaniline cathodes were prepared by electropolymerization of PhNH₂ from aqueous H₂SO₄, p-toluenesulfonic acid, or CF₃CO₂H solns. on properly surface-roughened Al lamellas; **anodes** were prepared by pressing Li or Al-Li alloy foils on Ni foils; and organic-electrolyte batteries were prepared by using these cathodes and **anodes**. The polymerization of PhNH₂ on improperly prepared Al lamellas or from aqueous HCl, HClO₄, or HBF₄ was unsuccessful. Superior performances of the invention vs. comparison batteries are also reported.

IT 7439-93-2, Lithium, uses and miscellaneous

RL: USES (Uses)

(**anodes** from nickel foil and, pressed, for batteries)

RN 7439-93-2 HCAPLUS

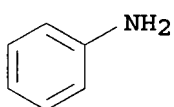
CN Lithium (7CI, 8CI, 9CI) (CA INDEX NAME)

Li

IT 25233-30-1, Polyaniline
RL: USES (Uses)
(cathodes, on aluminum, electropolymn. of, for batteries)
RN 25233-30-1 HCAPLUS
CN Benzenamine, homopolymer (9CI) (CA INDEX NAME)

CM 1

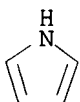
CRN 62-53-3
CMF C6 H7 N



IT 30604-81-0, Polypyrrole
RL: USES (Uses)
(coatings, cathodes with, polyaniline-aluminum composite, for batteries)
RN 30604-81-0 HCAPLUS
CN 1H-Pyrrole, homopolymer (9CI) (CA INDEX NAME)

CM 1

CRN 109-97-7
CMF C4 H5 N



IC ICM H01M004-60
ICS H01M010-36; H01M002-14; B32B015-08; C08G073-02
ICI C08J005-12, C08L079-02
CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)
Section cross-reference(s): 38
IT Electric conductors
(polymeric, battery cathodes with active mass and coatings of)
IT 7439-93-2, Lithium, uses and miscellaneous
RL: USES (Uses)
(anodes from nickel foil and, pressed, for batteries)
IT 25233-30-1, Polyaniline
RL: USES (Uses)
(cathodes, on aluminum, electropolymn. of, for batteries)
IT 110-00-9D, derivs., polymers 30604-81-0, Polypyrrole
RL: USES (Uses)
(coatings, cathodes with, polyaniline-aluminum composite, for

batteries)

L113 ANSWER 27 OF 29 HCAPLUS COPYRIGHT 2006 ACS on STN
 ACCESSION NUMBER: 1989:118381 HCAPLUS
 DOCUMENT NUMBER: 110:118381
 TITLE: Batteries with solid-state electrolytes
 INVENTOR(S): Furukawa, Sanehiro; Saito, Toshihiko; Ikemachi, Takaaki
 PATENT ASSIGNEE(S): Sanyo Electric Co., Ltd., Japan
 SOURCE: Jpn. Kokai Tokkyo Koho, 5 pp.
 CODEN: JKXXAF
 DOCUMENT TYPE: Patent
 LANGUAGE: Japanese
 FAMILY ACC. NUM. COUNT: 1
 PATENT INFORMATION:

| PATENT NO. | KIND | DATE | APPLICATION NO. | DATE |
|---------------------------------------|------|----------|-----------------|--------------|
| JP 63289760 | A2 | 19881128 | JP 1987-123113 | 198705 20 |
| PRIORITY APPLN. INFO.: JP 1987-123113 | | | | 198705 20 |

AB Metal oxide solid-electrolyte batteries have **anodes** of layers of alkali metals previously treated by current passage. This treatment carried out on the **anodes** laminated with electrolyte layers activates the **anodes** by forming finely **roughened** surfaces and increases the battery performance by decreasing the internal resistance. Thus, a block of 2 layers of **poly(ethylene oxide)-LiClO₄** solid electrolyte was attached at its top and bottom with 2 0.4-mm-thick Li sheets and a.c. (10 MHz, 6V) was passed through this block for 5 h. The block was separated between the 2 electrolyte layers; each half was combined with a cathode sheet containing **poly(ethylene oxide)**, LiClO₄, and MnO₂; treated at 60° for 5 h; and installed in a button-type battery. This battery showed 22-k Ω internal impedance, vs. 35 k Ω for a similar battery with an untreated **anode**.

IT 7439-93-2, Lithium, uses and miscellaneous
 RL: USES (Uses)
 (**anodes**, surface treatment by current passage of, for solid-electrolyte batteries)

RN 7439-93-2 HCAPLUS
 CN Lithium (7CI, 8CI, 9CI) (CA INDEX NAME)

Li

IC ICM H01M004-06
 ICS H01M004-12; H01M006-18
 CC 52-2 (**Electrochemical**, Radiational, and Thermal Energy Technology)

Section cross-reference(s): 72

ST battery solid electrolyte **anode** treatment

IT **Anodes**
 (battery, alkali metal, surface treatment by current passage of,

solid-electrolyte)
 IT 7439-93-2, Lithium, uses and miscellaneous
 RL: USES (Uses)
 (anodes, surface treatment by current passage of, for
 solid-electrolyte batteries)

L113 ANSWER 28 OF 29 HCAPLUS COPYRIGHT 2006 ACS on STN

ACCESSION NUMBER: 1987:558360 HCAPLUS
 DOCUMENT NUMBER: 107:158360
 TITLE: Manufacture of plastic-battery electrodes
 INVENTOR(S): Yokoishi, Shoji; Nonobe, Yasuhiro; Onishi, Toru
 PATENT ASSIGNEE(S): Toyota Motor Corp., Japan
 SOURCE: Jpn. Kokai Tokkyo Koho, 5 pp.
 CODEN: JKXXAF
 DOCUMENT TYPE: Patent
 LANGUAGE: Japanese
 FAMILY ACC. NUM. COUNT: 1
 PATENT INFORMATION:

| PATENT NO. | KIND | DATE | APPLICATION NO. | DATE |
|-------------------------------------|------|----------|-----------------|--------------|
| JP 62165859 | A2 | 19870722 | JP 1986-6650 | 198601 15 |
| PRIORITY APPLN. INFO.: JP 1986-6650 | | | | 198601 15 |

AB A conductive grid and a counterelectrode covered with a film having a draining time $t = 100-300$ s are used to deposit **conducting polymer** on the grid to form a plastic-battery cathode and simultaneously producing an **anode** for the same battery on the counterelectrode. A carbon-fiber grid sheet and an Al counterelectrode covered with a filter paper were immersed in an MeCN solution containing 0.5 LiBF₄ and 0.2M pyrrole, and a 7-mA/cm² was passed to deposit polypyrrole on the carbon-fiber grid and Li on the counterelectrode. Li layers deposited on Al counterelectrodes covered with filter papers having $t = 100-300$ s had **smooth surface** and even thickness whereas Li layers deposited on Al counterelectrodes covered with filter papers having $t = 550$ or 570 s had **rough** surface, and the Li deposition efficiency was higher for layers obtained according to the invention than for the controls.

IT 7439-93-2, Lithium, uses and miscellaneous
 RL: USES (Uses)
 (anodes, simultaneous preparation of polypyrrole cathodes
 and, for batteries)
 RN 7439-93-2 HCAPLUS
 CN Lithium (7CI, 8CI, 9CI) (CA INDEX NAME)

Li

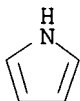
IT 30604-81-0, Polypyrrole
 RL: USES (Uses)
 (cathodes, simultaneous preparation of lithium **anodes** and,
 for batteries)
 RN 30604-81-0 HCAPLUS

CN 1H-Pyrrole, homopolymer (9CI) (CA INDEX NAME)

CM 1

CRN 109-97-7

CMF C4 H5 N



IC ICM H01M004-04

CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)

Section cross-reference(s): 38, 43

IT Anodes

(battery, lithium, simultaneous preparation of polypyrrole cathodes and)

IT Cathodes

(battery, polypyrrole, simultaneous preparation of lithium anodes and)

IT 7439-93-2, Lithium, uses and miscellaneous

RL: USES (Uses)

(anodes, simultaneous preparation of polypyrrole cathodes and, for batteries)

IT 30604-81-0, Polypyrrole

RL: USES (Uses)

(cathodes, simultaneous preparation of lithium anodes and, for batteries)

L113 ANSWER 29 OF 29 HCAPLUS COPYRIGHT 2006 ACS on STN

ACCESSION NUMBER: 1984:10068 HCAPLUS

DOCUMENT NUMBER: 100:10068

TITLE: Lithium batteries

INVENTOR(S): Bleszinski, Walter, Jr.; Bruder, Alan H.

PATENT ASSIGNEE(S): Polaroid Corp. , USA

SOURCE: Eur. Pat. Appl., 32 pp.

CODEN: EPXXDW

DOCUMENT TYPE: Patent

LANGUAGE: English

FAMILY ACC. NUM. COUNT: 1

PATENT INFORMATION:

| PATENT NO. | KIND | DATE | APPLICATION NO. | DATE |
|-------------------|------|----------|-----------------|----------|
| ----- | ---- | ----- | ----- | |
| EP 92834 | A1 | 19831102 | EP 1983-104046 | 19830425 |
| EP 92834 | B1 | 19880727 | | |
| R: DE, FR, GB, NL | | | | |
| US 4977046 | A | 19901211 | US 1982-372158 | 19820426 |
| CA 1196375 | A1 | 19851105 | CA 1983-423693 | 19830316 |

JP 58198864 A2 19831118 JP 1983-72771

198304
25

JP 04025672 B4 19920501

PRIORITY APPLN. INFO.:

US 1982-372158

A

198204
26

AB **Li batteries** comprise cathodes formed as slurries of MnO₂ and C in an organic solution of electrolyte in contact with a **Cu substrate**, and sheet **Li anodes** adhered to a conductive plastic or a **roughened Cu substrate**.

IC H01M006-48; H01M004-64

CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)

ST **lithium battery** laminar; manganese dioxide **lithium battery**IT **Batteries**, primary
(lithium-manganese dioxide, laminar)

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<20061204/UP>

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<<< SIMULTANEOUS LEFT AND RIGHT TRUNCATION AVAILABLE IN
THE BASIC INDEX >>>

=> d 1101 que stat

L24 40640 SEA FILE=HCAPLUS POLYACRYLIC# OR POLYACRYLATE#

L25 QUE POLYMETHACRYLIC# OR POLYMETHACRYLATE# OR POLY(A) (ACRYLIC# OR ACRYLATE# OR METHACRYLIC# OR METHACRYLATE#) OR (POLY OR POLYM? OR COPOLYM? OR HOMOPOLYM? OR RESIN?) (2A) (ACRYLATE# OR METHACRYLATE# OR ACRYLIC# OR METHACRYLIC#)

L31 QUE POLY(W) (ETHYLENE# OR ETHENE# OR PROPYLENE# OR PROPENE# OR BUTYLENE# OR ISOBUTYLENE# OR BUTENE#)

L32 QUE (ETHYLEN## OR PROPYLEN## OR BUTYLEN## OR BUTEN## OR OLEFIN##) (A) (POLYMER? OR POLYM# OR HOMOPOLYMER? OR HOMOPOLYM# OR RESIN?)

L34 QUE POLYAMIDE?

L36 QUE POLYCARBONATE?

L37 QUE SUBSTRAT?

L40 QUE (NEGATIVE? OR NEG#) (A) ELECTROD## OR ANOD##

L41 QUE BATTERY OR BATTERIES

L42 QUE ROUGH?

L43 QUE ANGSTROM#

L69 221363 SEA FILE=WPIX BATTERY OR BATTERIES

L70 17287 SEA FILE=WPIX LITHIUM? (2A) L69

L75 165888 SEA FILE=WPIX L24 OR L25

L76 231364 SEA FILE=WPIX POLYESTER?

L77 87022 SEA FILE=WPIX POLYOLEFIN?

L78 338216 SEA FILE=WPIX POLYETHYLENE# OR POLYETHENE# OR PE OR

POLYPROPYLENE# OR POLYPROPENE# OR PP OR POLYBUTYLENE# OR
 POLYISOBUTYLENE# OR POLYBUTENE# OR POLYISOBUTENE#

L79 205772 SEA FILE=WPIX L31 OR L32 OR L34 OR L36
 L80 26436 SEA FILE=WPIX CONDUCT?(2A) (POLYM? OR COPOLYM? OR
 HOMOPOLYM? OR RESIN?)

L96 210 SEA FILE=COMPENDEX L40 AND L41 AND L37
 L97 11 SEA FILE=COMPENDEX L96 AND (L42 OR L43)
 L98 8 SEA FILE=COMPENDEX L97 AND L70
 L99 1 SEA FILE=COMPENDEX (L97 OR L98) AND (L75 OR L76 OR L77
 OR L78 OR L79 OR L80)
 L100 3 SEA FILE=COMPENDEX (L97 OR L98) AND METAL#
 L101 3 SEA FILE=COMPENDEX L99 OR L100

=> d l101 iall 1-3

L101 ANSWER 1 OF 3 COMPENDEX COPYRIGHT 2006 EEI on STN
 ACCESSION NUMBER: 2006(8):9687 COMPENDEX
 TITLE: Synthesis of nanoparticles polypyrrole on Au
 substrates.
 AUTHOR: Liu, Yu-Chuan (Department of Chemical
 Engineering Vanung University, Chung-Li City,
 Tao-Yuan, Taiwan); Tsai, Chun-En; Chiu, Wen-Hui
 MEETING TITLE: 207th Meeting of the Electrochemical Society.
 MEETING LOCATION: Quebec, Canada
 MEETING DATE: 15 May 2005-20 May 2005
 SOURCE: Meeting Abstracts 2005.p 1673
 SOURCE: 207th Meeting of the Electrochemical Society -
 Meeting Abstracts
 ISSN: 1091-8213

PUBLICATION YEAR: 2005
 MEETING NUMBER: 66443
 DOCUMENT TYPE: Conference Article
 TREATMENT CODE: Experimental
 LANGUAGE: English
 ABSTRACT: Among a number of **conducting
 polymers** (CP), polypyrrole (PPy), has
 attracted considerable attention because it
 offers reasonably high conductivity and has
 fairly good environmental stability, and it can
 be widely used in **batteries**,^{1,2}
 supercapacitors,³ sensors, ^{4,5} anhydrous
 electrorheological fluids,⁶ micromave shielding
 and corrosion protection.^{7,8} As we know, the
 electrical conductivity of PPy is attributed to
 the electrons hopping along and across the
 polymer chains with conjugating bonds.^{9,10} As a
 result, more positively charged PPy, more
 electron holes available, longer polymer chains
 and more co-planarity between interchains, are
 favorable for a higher conductivity performance.
 The fabrication of materials with
 nanometer-sized dimensions has become an
 important branch of research. Recently,
 nanoparticles of noble **metals** are
 attracting much attention from scientific and
 technological viewpoints because of their
 interesting optical, electrochemical, photo
 electrochemical and electronic properties.
 Methods to nanoparticles fabrication include

chemical reduction, sonochemical reduction, laser ablation, radiolytic reduction, **metal** evaporation, and Ar⁺ ion sputtering, etc. In this work, PPy was electrodeposited on Au **substrates** in an aqueous solution containing pyrrole monomers and positively charged Au nanocomplexes which were obtained from the oxidation-reduction cycles (ORC) procedure for **roughening** the Au **substrate**. During the ORC treatment, the Au **substrate** was cycled in a deoxygenated aqueous solution containing 0.1 N KCl from -0.28 to +1.22 V vs Ag/AgCl at 500 mV/s with 25 scans. The durations at the cathodic and **anodic** vertexes are 10 and 5 s, respectively. Then the AuCl₄-nanocomplexes were prepared in this aqueous solution. Subsequently, 0.1 M pyrrole monomers were added into this AuCl₄-containing aqueous solution and an **anodic** potential of 0.85 V vs Ag/AgCl was used to polymerize PPy on an Au **substrate**. Examining the surface morphology of PPy electrodeposited on an Au **substrate** in a solution containing AuCl₄ - nanocomplexes, it is found that the marked PPy exhibits particularly steric morphology with nanoparticles structures, as demonstrated in Figure 1, which is distinct from the typically granular raspberry morphology of perchlorate-doped PPy. The special structure would be favorable for its practical applications. The other characteristics and its application are underway. 10 Refs.

CLASSIFICATION CODE:

815.1.1 Organic Polymers; 933.1 Crystalline Solids; 547.1 Precious Metals; 802.2 Chemical Reactions; 708.2 Conducting Materials; 704.1 Electric Components

CONTROLLED TERM:

*Polypyrroles; Synthesis (chemical); Conductive plastics; Gold; Capacitors; Electric conductivity; Corrosion protection; Nanostructured materials

SUPPLEMENTARY TERM:

Supercapacitors; Nanoparticles; Environmental stability; Electrons hopping

ELEMENT TERM:

As; Ar; Au; Cl*K; KCl; K cp; cp; Cl cp; Ag; Ag*Cl; AgCl; Ag cp; Au*Cl; AuCl; Au cp

L101 ANSWER 2 OF 3 COMPENDEX COPYRIGHT 2006 EEI on STN

ACCESSION NUMBER: 2005(39):10028 COMPENDEX

TITLE: Thick vacuum deposited silicon films suitable for the **anode** of Li-ion **battery**.

AUTHOR: Uehara, Makiko (Department of Applied Chemistry Harbin Institute of Technology, Harbin 150001, China); Suzuki, Junji; Tamura, Kohki; Sekine, Kyoichi; Takamura, Tsutomu

SOURCE: Journal of Power Sources v 146 n 1-2 Aug 26 2005 2005.p 441-444

CODEN: JPSODZ ISSN: 0378-7753

PUBLICATION YEAR: 2005

DOCUMENT TYPE: Journal

TREATMENT CODE: Experimental
LANGUAGE: English
ABSTRACT: Vacuum deposited silicon film on a Ni foil **substrate** showed very stable Li charge/discharge performance in PC containing 1 M LiClO₄. The performance, however, became poorer rapidly with the increase in the film thickness. In an attempt to attain long cycleability with large capacity for the vacuum deposited thicker silicon film, surface morphology of the depositing **substrate metal** was examined. Filing with a sand paper was quite effective for providing longer cycleability as compared to the pristine Ni foil. Etching with aqueous solution of FeCl₃ resulted in giving the surface **roughened** to a great extent. A 1.1 μm thick silicon film deposited on the well-etched **substrate** maintained the specific capacity over 1500 mAh g⁻¹ even after 400 cycles with 1 C rate constant current charge/discharge. The most **roughened** surface could be obtained by depositing electrolytically on a copper foil. The surface revealed a jammed group of tiny pyramid like steeple-crowned caps. A 3.6 μm thick silicon film deposited on the copper **substrate** thus obtained maintained constantly around 2000 mAh g⁻¹ during 50 cycles. \$CPY 2005 Published by Elsevier B.V. 8 Refs.

CLASSIFICATION CODE: 702.1.1 Primary Batteries; 549.3 Others (including Bismuth, Boron, Cadmium, Cobalt, Mercury, Niobium, Selenium, Silicon, Tellurium and Zirconium); 714.2 Semiconductor Devices and Integrated Circuits; 813.2 Coating Materials; 931.2 Physical Properties of Gases, Liquids and Solids; 802.2 Chemical Reactions

CONTROLLED TERM: *Lithium batteries; Thick films; Vacuum deposited coatings; Morphology; Etching; Surface **roughness**; Silicon

SUPPLEMENTARY TERM: Li-ion batteries; New **anode** material; Silicon films; Vacuum deposition; Surface **roughening**

ELEMENT TERM: Ni; Li; Cl*Li*O; LiClO; Li cp; cp; Cl cp; O cp; Cl*Fe; FeCl; Fe cp

L101 ANSWER 3 OF 3 COMPENDEX COPYRIGHT 2006 EEI on STN
ACCESSION NUMBER: 2005(30):9445 COMPENDEX
TITLE: Characterization of all-solid-state thin film **batteries** (TFBS).
AUTHOR: Moon, Hee-Soo (Division of Materials Science and Engineering Hanyang University, Seongdong-gu, Seoul, 133-791, South Korea); Kim, Young-Jae; Kim, Jung-Nam; Park, Jong-Wan
MEETING TITLE: 2004 Joint International Meeting - 206th Meeting of the Electrochemical Society/2004 Fall Meeting of the Electrochemical Society of Japan, .
MEETING LOCATION: Honolulu, HI, United States
MEETING DATE: 03 Oct 2004-08 Oct 2004
SOURCE: Meeting Abstracts 2004.p 126
SOURCE: 2004 Joint International Meeting - 206th Meeting

PUBLICATION YEAR:
MEETING NUMBER:
DOCUMENT TYPE:
TREATMENT CODE:
LANGUAGE:
ABSTRACT:

of the Electrochemical Society/2004 Fall Meeting
of the Electrochemical Society of Japan, MA
2004-02

ISSN: 1091-8213

2004

65239

Conference Article

Experimental

English

Demand for low power, **battery** operated devices is on the rise, particularly in portable equipment needing longer operation with higher reliability. Advances in the microelectronics industry and the miniaturization of electronic devices have reduced the current and power requirements of some of these devices to extremely low levels. This has made possible the use of thin film **batteries** (TFBs) as power sources for these devices. Therefore, it is important to develop long lasting and high-energy efficient TFBs, which can be as an integral part of microelectronic circuits. TFBs made with solid-state thin film components can realize an appropriate capacity by adjusting thickness and deposition area. With using solid-state electrolytes, such as LIPON and polymer electrolyte, TFBs can be relatively free from the problems of bulk-type secondary **batteries**. Typical structure of TFBs is multilevel thin films consisting sequentially of current collector/cathode/ solid electrolyte/**anode**/ current collector/protective layer (Fig.1 and Fig.2). These thin films are deposited by chemical vapor deposition (CVD) or physical vapor deposition (PVD) methods utilizing microelectronic technologies. In this work, we fabricated TFBs using rf magnetron sputter, E-beam evaporator and doctor-blade method. Lithium manganese oxide, LIPON (or solid polymer electrolyte, P(EO)10LiTFSI+5 wt% R812+6 wt% D4CN) and lithium **metal** were used as the cathode, solid electrolyte and **anode**, respectively. Pt-deposited TiO₂/SiO₂/Si wafer was used as **substrate**. The thickness of LIPON and SPE was about 1.4 μm and 100 μm, respectively. Lithium **metal** was deposited on LIPON by thermal evaporator. When polymer electrolyte used, lithium **metal** and electrolyte stacked by mechanical pressing. Surface **roughness** and morphologies of the each film was measured by AFM and FE-SEM. The chemical bonding was analyzed by XPS. Cathode electrode was performed the half-cells test. In this test, we used 1 M solution of LiPF₆ in EC-DMC(1:1) as liquid electrolyte. Figure 3 showed discharge capacities of the TFBs we fabricated using solid polymer electrolyte. \$CPY 2004 The Electrochemical Society, Inc. 1 Refs. 714.2 Semiconductor Devices and Integrated

CLASSIFICATION CODE:

CONTROLLED TERM:

Circuits; 702.1.2 Secondary Batteries; 525.2 Energy Conservation; 713 Electronic Circuits; 815.1.1 Organic Polymers; 817.1 Plastics Products
 *Thin film devices; Scanning electron microscopy; Polyelectrolytes; Chemical vapor deposition; Physical vapor deposition; Surface roughness; Atomic force microscopy; Secondary batteries; Energy efficiency; Microelectronics

SUPPLEMENTARY TERM:

Battery operated devices; Thin film batteries (TFB); Mechanical pressing; Power sources

ELEMENT TERM:

P; F*I*Li*S*T; LiTFSI; Li cp; cp; T cp; F cp; S cp; I cp; C*D*N; D4CN; D cp; C cp; N cp; Pt; O*Si*Ti; O sy 3; sy 3; Si sy 3; Ti sy 3; TiO2/SiO; Ti cp; O cp; Si cp; F*Li*P; LiPF; P cp

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AND HELP CHANGE (last updated Aug 11, 2006) >>>

=> d l110 que stat

L37 QUE SUBSTRAT?
 L40 QUE (NEGATIVE? OR NEG#) (A)ELECTROD## OR ANOD##
 L41 QUE BATTERY OR BATTERIES
 L42 QUE ROUGH?
 L43 QUE ANGSTROM#
 L69 221363 SEA FILE=WPIX BATTERY OR BATTERIES
 L70 17287 SEA FILE=WPIX LITHIUM? (2A)L69
 L106 156 SEA FILE=INSPEC L40 AND L41 AND L37
 L107 7 SEA FILE=INSPEC L106 AND (L42 OR L43)
 L109 1 SEA FILE=INSPEC L107 AND METAL#
 L110 1 SEA FILE=INSPEC L109 AND L70

=> d l110 iall

L110 ANSWER 1 OF 1 INSPEC (C) 2006 IET on STN

ACCESSION NUMBER: 2006:8756659 INSPEC

TITLE: Thick vacuum deposited silicon films suitable
 for the anode of Li-ion
 battery

AUTHOR: Takamura, T.; (Dept. of Appl. Chem., Harbin
 Inst. of Technol., China), Uehara, M.; Suzuki,
 J.; Tamura, K.; Sekine, K.

SOURCE: Journal of Power Sources (26 Aug. 2005),
 vol.146, no.1-2, p. 441-4, 8 refs.

DOCUMENT TYPE:
TREATMENT CODE:
COUNTRY:
LANGUAGE:
ABSTRACT:

CODEN: JPSODZ, ISSN: 0378-7753
SICI: 0378-7753(20050826)146:1/2L.441:TVDS;1-X
Doc.No.: S0378-7753(05)00426-X
Published by: Elsevier, Switzerland
Journal
Practical
Switzerland
English
Vacuum deposited silicon film on a Ni foil
substrate showed very stable Li
charge/discharge performance in PC containing 1M
LiClO₄. The performance, however, became poorer
rapidly with the increase in the film thickness.
In an attempt to attain long cycleability with
large capacity for the vacuum deposited thicker
silicon film, surface morphology of the
depositing **substrate metal**
was examined. Filing with a sand paper was quite
effective for providing longer cycleability as
compared to the pristine Ni foil. Etching with
aqueous solution of FeCl₃ resulted in giving the
surface **roughened** to a great extent. A
1.1µm thick silicon film deposited on the
well-etched **substrate** maintained the
specific capacity over 1500mAhg⁻¹ even after 400
cycles with 1C rate constant current
charge/discharge. The most **roughened**
surface could be obtained by depositing
electrolytically on a copper foil. The surface
revealed a jammed group of tiny pyramid like
steeple-crowned caps. A 3.6µm thick silicon
film deposited on the copper **substrate**
thus obtained maintained constantly around
2000mAhg⁻¹ during 50 cycles. [All rights
reserved Elsevier]

CLASSIFICATION CODE:

A8630F Secondary cells; A8245 Electrochemistry
and electrophoresis; A8115G Vacuum deposition;
A6855 Thin film growth, structure, and epitaxy;
A6820 Solid surface structure; B8410E Secondary
cells

CONTROLLED TERM:

anodes; electrochemical electrodes;
etching; lithium compounds; nickel; secondary
cells; silicon; surface morphology; thick films;
vacuum deposited coatings

SUPPLEMENTARY TERM:

lithium-ion battery; foil substrate;
cycleability; surface morphology; etching;
steeple-crowned caps; anode material; vacuum
deposition; Li; FeCl₃; Ni

CHEMICAL INDEXING:

Li int, Li el; FeCl₃ bin, Cl₃ bin, Cl bin, Fe
bin; Ni el

ELEMENT TERMS:

Cl; Li; Fe; Ni; Cl*Li*O; LiClO₄; Li cp; cp; Cl
cp; O cp; Cl*Fe; FeCl₃; Fe cp; C

=>